

Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 4

**P3951**

**[4860] - 1**

**M.E. (Civil) (Construction and Management)**

**MATHEMATICS**

**(2008 Pattern)**

*Time :4 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each Section.*
- 2) *Figures to the right indicate full marks.*

**SECTION - I**

**Q1)** A contractor bids for 15 construction projects simultaneously. In a period of 3 years, the total projects bid by the contractor are 60. Determine the probability of the contractor securing. **[18]**

- a) Single bid
- b) 5 bids
- c) No bid

**Q2)** a) Explain with examples : **[6]**

- i) Discrete probability distribution.
- ii) Continuous probability distribution

b) Explain Normal Distribution and its application in Construction project scheduling and cost control. **[10]**

**Q3)** For the following data, determine various dispersion measures. If standard deviation should not be greater than 5% is the sample to be accepted or rejected? **[16]**

**P.T.O.**

Sample No.	Slump (mm)
1	153
2	143
3	150
4	151
5	142
6	155
7	153
8	148
9	141
10	156

**Q4)** Explain EOQ graphically and discuss its advantages and limitations. Illustrate the sensitivity analysis on the EDQ with a proper examples. **[16]**

### SECTION - II

**Q5)** For the data given in Question '7', establish the linear regression equation linking the activity duration in days with the resources consumed and its proper utilization. Comment on the accuracy of the relationship. **[16]**

**Q6)** Explain Vorster-Sears mathematical model and the waiting line mathematical model with proper examples. **[8+8]**

**Q7)** The duration of an activity depends upon the resource allocation (ultimately the total money spent) and proper utilization of these resources (Rated on a 10 point scale with higher rating meaning improper utilization) A particular construction activity has the following historical track record. **[16]**

Activity duration (y) days	Funds allocated (Rs.) ( $X_1$ )	Score for resource utilization ( $X_2$ )
25	25,000	8
10	55,000	3
40	13,000	4
12	50,000	6
15	45,000	9
27	24,000	8
38	14,000	5
45	10,000	7
18	30,000	2
32	17,000	3

Determine

- a) Individual co-relation coefficients between  $y$  and  $x_1$  as well as  $y$  and  $x_2$ .
- b) Partial co-relation coefficients between  $y$  and  $x_1$  and  $y$  with  $x_2$ .
- c) Total co-relation coefficients between  $y$  and  $x_1$  and  $y$  with  $x_2$ .
- d) Comment on the co-relations obtained.

**Q8)** Prepare a simulation model based on the Monte Carlo simulation, to generate a range of random numbers, for the mean, as well as deviation from the mean, for the actual cost of 20 projects of similar nature as given below. Also run the model in order to estimate the project cost for the next 10 numbers. **[18]**

Project No.	Project cost in lakhs
1	35
2	20
3	25
4	37.2
5	55.3
6	43
7	23.8
8	62.3
9	18.0
10	15.0
11	24.0
12	28.0
13	33.9
14	43.9
15	21.9
16	39.9
17	44.3
18	31.2
19	11.5
20	13.5

APPENDIX 'C'

TABLE OF RANDOM NUMBERS

39 65 76 45 45	19 90 69 64 61	20 26 36 31 62	58 24 97 14 97	95 06 70 99 00
73 71 23 70 90	65 97 60 12 11	31 56 34 19 19	47 83 75 51 53	30 62 38 20 44
72 20 47 33 84	61 67 47 97 19	98 40 07 17 66	23 05 09 51 80	59 78 11 52 69
75 17 25 69 17	17 95 21 78 48	24 33 45 77 48	69 81 84 09 29	93 22 70 45 80
37 48 79 88 74	63 52 06 34 30	01 31 60 10 27	35 07 79 71 53	28 99 52 01 41
02 89 08 16 94	85 53 83 29 95	56 27 09 24 43	21 78 55 09 82	72 61 88 73 61
87 18 15 70 07	37 40 79 12 38	48 13 93 15 96	41 92 45 71 51	09 18 25 58 94
98 83 71 70 15	89 09 39 59 24	00 06 41 41 20	14 36 59 25 47	54 45 17 24 89
10 08 58 07 04	76 62 60 48 68	58 76 17 14 86	59 53 11 52 21	66 04 18 72 87
17 90 56 37 31	71 82 13 50 41	27 55 10 24 92	28 04 67 53 44	95 23 00 84 47
93 05 31 03 07	34 18 04 52 35	74 13 39 55 22	68 95 23 92 35	36 63 70 35 31
21 80 11 47 99	11 20 99 45 18	76 51 94 84 86	13 79 93 37 55	98 16 04 41 67
95 18 94 36 97	23 37 83 28 71	79 57 95 13 91	09 61 87 25 21	56 20 11 32 44
97 08 31 55 73	10 65 81 92 59	77 31 61 95 46	20 44 90 32 64	23 99 76 75 63
69 26 88 86 13	59 71 74 17 32	48 38 75 93 29	73 37 32 04 05	60 82 29 20 25
41 27 10 25 03	87 63 93 95 17	81 83 83 04 49	77 45 85 50 51	79 88 01 97 30
91 94 50 63 62	08 61 74 51 68	92 79 43 83 79	29 18 94 51 23	14 85 11 47 23
80 06 54 18 47	08 52 85 08 40	48 40 35 94 22	72 65 71 08 86	50 03 42 99 36
76 72 77 63 99	89 85 84 46 06	64 71 06 21 66	89 37 20 70 01	61 65 70 22 12
59 40 24 13 75	42 29 82 23 19	07 94 76 10 08	81 30 15 89 14	81 83 17 16 33
63 62 06 34 41	79 53 36 02 95	94 61 09 43 62	20 21 14 68 86	84 95 48 46 45
78 47 23 53 90	79 93 96 38 63	34 85 52 05 09	85 43 01 72 73	14 93 87 81 40
87 68 62 15 43	97 48 72 66 48	53 16 71 13 81	59 97 50 99 92	24 62 20 42 30
47 60 92 10 77	26 97 05 73 51	88 46 38 00 58	72 63 49 29 31	75 70 16 08 24
56 88 87 59 41	06 87 37 78 48	65 88 69 58 39	88 02 84 27 82	85 81 56 39 38
22 17 68 65 84	86 02 22 57 51	68 69 80 95 44	11 29 01 95 80	49 34 35 86 47
19 36 27 59 46	39 77 32 77 09	79 57 92 36 59	89 74 39 82 15	05 50 94 34 74
16 77 23 02 77	28 06 24 25 93	22 45 44 84 11	87 80 61 65 31	09 71 91 74 25
78 43 66 07 61	97 66 63 99 61	80 45 67 93 82	59 73 19 85 23	53 33 65 97 21
03 28 28 26 08	69 30 16 09 05	53 58 47 70 93	66 56 45 65 79	45 56 20 19 47
04 31 17 21 56	33 63 99 19 87	26 72 39 27 67	53 77 57 68 93	60 61 97 22 61
61 06 98 03 91	87 14 77 43 96	43 00 65 98 50	45 60 33 01 07	98 90 46 50 47
23 58 35 26 00	99 53 93 61 28	52 70 05 48 34	56 65 05 61 86	90 92 10 79 80
15 39 25 70 99	93 86 52 77 65	15 35 59 05 28	22 87 26 07 47	86 96 98 29 06
58 71 96 30 24	18 46 23 34 27	85 13 99 24 44	49 18 09 79 49	74 16 32 23 02
93 22 53 64 39	07 10 63 76 35	37 03 04 79 88	08 33 33 85 51	55 34 57 72 69
78 76 58 54 74	92 38 70 96 92	52 06 79 79 45	82 63 18 27 44	69 66 42 19 09
61 81 31 96 82	00 57 25 60 56	46 72 60 18 77	55 66 12 62 11	09 99 55 64 57
42 88 07 10 05	24 98 65 08 21	47 21 61 88 32	27 80 30 21 60	10 92 35 36 12
77 94 30 05 33	28 10 99 00 27	12 73 73 99 12	39 99 57 94 82	96 88 87 17 91



Total No. of Questions : 8]

SEAT No. :

P3957

[4860] - 10

[Total No. of Pages : 2

**M.E. (Civil) (Construction and Management)**

**VALUE ENGINEERING**

**(2008 Pattern) (Elective - II(c))**

*Time :4 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Figures to the right indicate full marks.*

**SECTION - I**

**Q1)** With a flow diagram, Elaborate the sequential steps to be taken, in value Analysis and Value Engineering. What is the outcome of these steps? Discuss. **[18]**

**Q2)** Elaborate with examples, the following factors contributing to value :**[16]**

- a) Aesthetic
- b) Ergonomic
- c) Technical
- d) Economic

**Q3)** What is life cycle analysis? What is the procedure? What data is needed from a construction project, to perform LCA? Elaborate. **[16]**

**Q4)** Discuss 3 essential requirements for any commodity to possess value, with examples. Discuss various types of values. **[16]**

**P.T.O.**

## **SECTION - II**

- Q5)** Explain how the organisational information gets co-related with function analysis for implementing value engineering, for items listed below :
- a) Output from cranes [4]
  - b) Effectiveness of water proofing [4]
  - c) Efficiency in pile driving [4]
  - d) Hazard improvement w.r.t electrical connections [6]
- Q6)** Discuss the problems faced in implementing value analysis by Indian Construction Companies and Suggest remedies to these problems. [16]
- Q7)** Explain any 2 traditional methods and any 2 (DCF) methods used in the forecasting of the capital investments, with examples. [16]
- Q8)** Discuss any 8 commandments of the value analysis, quoting suitable examples. [16]



Total No. of Questions : 10]

SEAT No. :

**P4005**

[Total No. of Pages : 3

**[4860] - 100**

**M.E. (Mechanical) (Design Engineering)**

**PROCESS EQUIPMENT DESIGN**

**(2008 Pattern) (Elective - II(b))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer any three questions from each section.*
- 2) *Answers to two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Your answer will be valued as a whole.*
- 6) *Use of logarithmic tables, slide rules, Mollier chart, electronic steam table and electronic pocket calculator and steam table is allowed.*
- 7) *Assume suitable data, if necessary giving reasons.*

**SECTION - I**

- Q1)** a) What is intragranular corrosion and stress corrosion? Explain the ways to avoid or reduce these types of corrosion. [6]
- b) A storage tank 6 m in diameter and 7.5 m in height has to be provided with self-supported conical roof. The slope of self-supported conical roof is 1 in 5. Roof is subjected to a superimposed load of 125 kg/m<sup>2</sup>. Density of plate material is 8000 kg/m<sup>3</sup>.  $E = 2 \times 10^6$  kg/cm<sup>2</sup>. Calculate minimum thickness required for fabrication of self-supported conical roof. [6]
- c) What are the role wind girders in open top storage tank? [6]
- Q2)** a) What are different types of “removable closures” for high pressure vessels? Explain any three of them. [6]
- b) A tall vessel of 1.5 m in diameter and 13m in height is to be provided with skirt support. The weight of vessel with attachments is 90,000 kg. Skirt diameter is equal to diameter of vessel and height is 2.2 m. Wind pressure on the vessel is 110kg/m<sup>3</sup>. Seismic coefficient = 0.08. Permissible stress in skirt material is 900 kg/cm<sup>2</sup> and permissible compressive stress is 800 kg/cm<sup>2</sup>. Estimate thickness of support. [10]

***P.T.O.***

- Q3)** a) What are entrainment separators? Explain their applications. [8]  
b) Explain with neat sketches design of self-supporting conical roof. [8]
- Q4)** a) Explain design of pressure vessel subjected to external pressure. [6]  
b) A high pressure vessel is to be operated at  $100 \text{ MN/m}^2$ . The inside diameter of vessel is 35 cm. The steel plate with yield strength of  $400 \text{ MN/m}^2$  is to be used for fabrication. Estimate wall thickness by maximum shear stress theory with factor of safety of 1.5. [10]
- Q5)** Write short notes on any Four : [16]  
a) Design considerations for process equipment design.  
b) Various types of roofs for storage vessels.  
c) Expansion joint used in process piping systems.  
d) Linings for chemical plants and equipment.  
e) Design of self-supporting roof for storage vessels.

## SECTION - II

- Q6)** a) Explain determination of shell thickness for packed distillation columns. [6]  
b) Explain either contacting devices in plate columns or types of packing in packed columns. [6]  
c) Explain effect of wind load and seismic load on tall vessels. [6]
- Q7)** a) Give classification of filters and explain leaf filter or rotary drum filter. [8]  
b) Discuss in detail design of skirt support. [8]
- Q8)** a) Differentiate between batch type driers and continuous driers. [8]  
b) Explain various safety measures considered in equipment design. [8]



- Q9)** a) With neat sketches explain construction, working and main design considerations of rotary drier. Give it's applications. [8]
- b) Explain design consideration for shell and tube heat consideration.[8]

**Q10)** Write short notes on any Four : [16]

- a) Vacuum Crystallizer
- b) Design of saddle support
- c) Types Relief valves
- d) Theories of failure
- e) Process flow diagrams



Total No. of Questions : 8]

SEAT No. :

**P4479**

**[4860] -101**

[Total No. of Pages : 3

**M.E. (Mechanical Engineering - Design Engineering)  
c-ROBOTICS  
( 2008 Course) (Semester - I) (Elective-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from each section.*
- 2) *Answer to the each section should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if required.*

**SECTION - I**

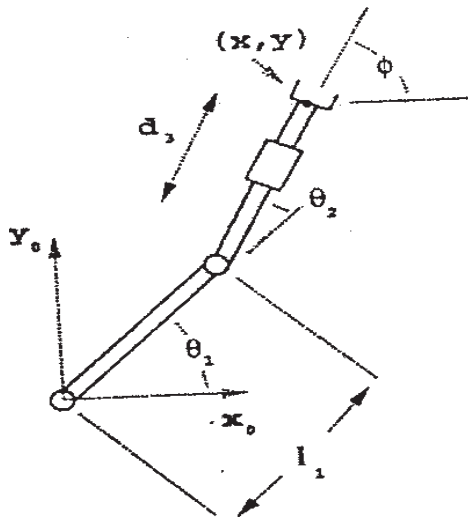
- Q1)** a) Explain elements of Robotics and its working. **[6]**
- b) Give classification of robotic systems used in industry and write a note on one of the them. **[10]**

- Q2)** a) Explain following terms. **[10]**
- i) Point to point control
  - ii) Work volume
  - iii) Spatial resolution
  - iv) Precision and Accuracy
  - v) Continuous path controls.
- b) Explain step by step procedure for forward kinematics and why inverse kinematics produces multiple solutions? **[6]**

**P.T.O.**

- Q3) a)** Figure shows a planar three-degrees-of-freedom manipulator. The first two joints are revolute, and the third is prismatic. The end effector position  $(x, y)$  is expressed with respect to the (fixed) world coordinate frame  $(x_0, y_0)$ , and the orientation of the end effector is defined as the angle of the second link  $\phi$  measured from the  $x_0$  axis as shown. The link length  $l$  is constant. The joint variables are given by the angles  $\theta_1$  and  $\theta_2$  and the displacement  $d_3$ , and are defined as shown. The example will be used throughout this section to demonstrate the ideas behind the various kinematic problems of interest.

Derive a relation for gripper position using matrix method. [10]



- b) Explain following configurations of robotic systems. [6]

- i) 2R Robot
- ii) 3R Robot
- iii) 3P Robot

- Q4) a)** Explain iterative method used in Newton-Euler Dynamic formulation. [8]

- b) Explain Lagrangian formulation of Manipulator. [10]

### SECTION - II

- Q5) a)** Write down the general considerations used in path description and generation. [10]

- b) Explain cartesian and polar coordinate system in terms of robotic analysis and its formulations using PUMA robot. [6]

- Q6)** a) Explain working of Optical Encoders and write a difference between absolute and incremental encoders. [8]  
b) Explain working of Touch and Slip Sensors. [8]
- Q7)** a) Write a note on Real-time operating systems used in robotics. [8]  
b) Explain working of H-Bridge drives used in DC motor controls. [8]
- Q8)** Write note in following (Attempt any three). [18]  
a) Overload current and stall detection methods.  
b) Microprocessor based robot controllers.  
c) Hydraulic and Pneumatic actuators in robotics.  
d) Proximity Sensors  
e) Velocity and Acceleration sensors.



[4860] - 102

M.E. (Mechanical) (Design Engineering)

VIBRATIONS AND NOISE CONTROL

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) Answer any three questions from each section.
- 2) Answer to the two sections should be written in separate book.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, whenever necessary.

SECTION - I

Q1) Find the lower natural frequency of vibration for the beam shown beam shown in fig. 1 by Rayleigh's method. [16]

$E = 1.96 \times 10^{11} \text{ N/m}^2, I = 4 \times 10^{-7} \text{ m}^4$

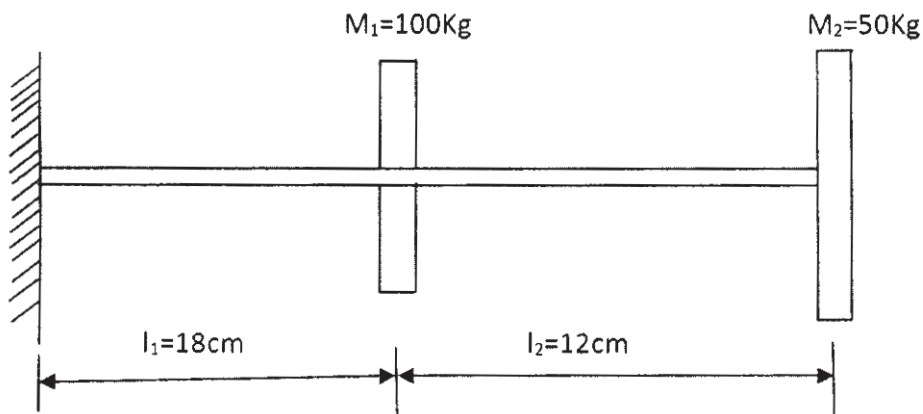


Fig.1

**Q2)** Using holzer method find the natural frequency of the system shown in Fig. 2. Assume  $J = 10\text{mm}^4$ ,  $K = 3 \text{ N/m}$ . [16]

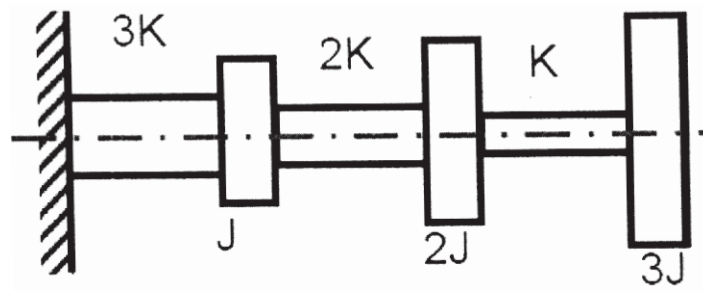


Fig.2

**Q3)** A uniform string of length  $l$  and a large initial tension  $S$ , stretched between two supports, is displaced laterally through a distance  $a_0$  at the centre as shown in fig. 3 and is released at  $t = 0$ . Find the equation of motion for the string. [16]

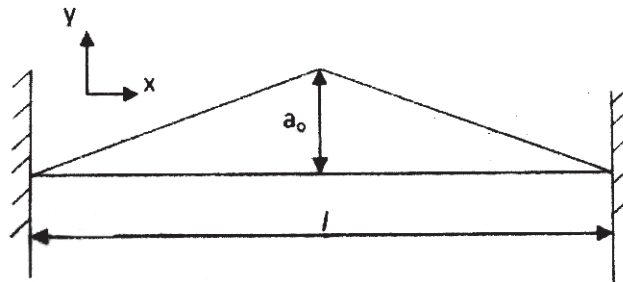


Fig. 3

**Q4)** Determine the forced response of the undamped single degree of freedom system to the forcing function shown in fig.4. [16]

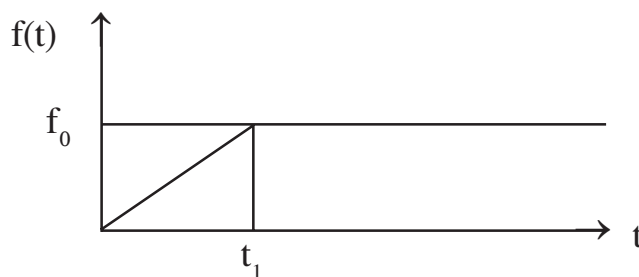


Fig.4

**Q5)** Explain following terms [18]

- i) Centrifugal Pendulum
- ii) Torsional vibration absorber.

## SECTION - II

- Q6)** a) Explain working principal of sesmo meter and accelerometer. [8]  
b) With a suitable example explain Experimental Modal Analysis. [8]
- Q7)** The motion of mechanical system with nonlinear restoring force is given by the equation  $x + w_n^2 x + \beta x^3 = 0$  with initial conditions  $x(0) = A$  and  $\dot{x}(0) = 0$ . Where  $w_n$  is the natural frequency of linear system. Using Perturbation method show that  $w^2 = w_n^2 + 3/4 \beta A^2$  upto first order correction. [16]
- Q8)** a) Define and sketch 'Autocorrelation' function. How is it useful in random vibrational analysis. [8]  
b) Two random processes are given as : [8]  
i)  $x = A \cos \omega t$   
ii)  $y = B \cos(\omega t + \phi)$   
The phase angle between the two processes is a random variable having uniform probability between 0 to  $2\pi$ . Calculate correlation between  $x$  &  $y$ .
- Q9)** a) Explain Octave band analysis of sound. [6]  
b) Explain in brief the following terms. [4]  
i) Sound power level.  
ii) Sound pressure level  
iii) Sound absorption coefficient  
iv) Acoustic intensity  
c) Define and explain sound power level and sound intensity. What is the sound pressure level of a sound source radiating energy at the rate of 0.6 W? [6]
- Q10)** Write the short notes of the following (any three) : [18]  
a) Soft and Hard spring  
b) Cross correlation function  
c) Ambient emission noise standards in india  
d) Wide band and narrow band process.



Total No. of Questions : 10]

SEAT No. :

P4007

[Total No. of Pages : 4

[4860] - 103

**M.E. (Mechanical) (Design Engineering)**

**ADVANCED MACHINE DESIGN**

**(2008 Pattern) (Revised)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Give the design procedure of helical spring for minimum weight. [6]
- b) A semi-elliptic multi-leaf spring is used for the suspension of vehicle. It consists of two extra full-length leaves & ten graduated - length leaves including the master leaf. The centre-to-centre distance between the spring eyes is 1.2m. The leaves are made of steel ( $S_{yt} = 1500 \text{ N/mm}^2$ ) and ( $E = 207000 \text{ N/mm}^2$ ); Use factor of safety is 2.5. The spring is to be designed for a maximum force of 30 kN. The leaves are prestressed so as to equalize stresses in all leaves. Determine ; [10]
- i) The cross section of leaves.
  - ii) The deflection at the end of spring.

**P.T.O.**



- Q2)** a) What is the cumulative fatigue damage? How the life of component subjected to different values of fluctuating stresses in cycle is estimated. [6]
- b) A transmission shaft carries a pulley midway between the two bearings. The bending moment of the pulley varies from 200 Nm to 600Nm, as the torsional moment in the shaft varies from 70 Nm to 200 Nm. The frequencies of variation of bending & torsional moments are equal to the shaft speed. The shaft is made of steel ( $S_{at} = 540 \text{ N/mm}^2$  &  $S_{yt} = 400 \text{ N/mm}^2$ ). The corrected endurance limit of the shaft is  $200 \text{ N/mm}^2$ . Determine the diameter of the shaft using a factor of safety of 2. [10]
- Q3)** a) Estimate the procedure for estimating the life of member subjected to creep. [8]
- b) Explain the following terms in context to creep. [8]
- i) Stress relaxation.
- ii) Estimated time to rupture.
- Q4)** a) Write in short about composite material & increasing use of these materials in mechanical engineering with specific application. [6]
- b) A graphite fibre/epoxy composite contents 50.6% graphite fibre by volume. The graphite fibres are 12.7 micro meter in diameter & the modulus of elasticity in transverse direction is 13.79 GPa. The epoxy material has a corresponding value of 3.5 GPa. Evaluate the modulus of elasticity along principle axis. Comment on effect of temperature & presence of moisture on composite. [10]
- Q5)** Write short note on the following : [18]
- a) Design for manufacturing & assembly.
- b) Vibration & surging of helical springs.
- c) Design for fatigue failure.

## SECTION - II

- Q6)** a) Suggest a simple method of handling multiple objectives in an optimization problem. [6]
- b) In a light weight equipment shaft is transmitting a torque of 900 Nm & is to have a rigidity of 90 Nm/degree. Assume a factor of safety is 1.5 based on yield strength. Design a shaft with minimum weight. What will be the change in design for minimum cost. Assume max. shear stress theory of failure. Use following data. [10]

Material	Mass density (kg/m <sup>3</sup> )	Material cost/wt. (Rs/N)	Yield strength (MPa)	Shear modulus (GPa)
Alloy steel	8500	16	130	80
Al. alloy	3000	32	50	26.7
Titanium alloy	4800	480	90	40
Magnesium alloy	2100	32	20	16

- Q7)** a) What is need of profile corrections of gears. Explain how it is carried out. [6]
- b) Two 20° full depth gears of 20 and 30 teeth are to be designed on the extended centre distance system using the recommended values for clearance  $f = \left( \frac{0.25}{P_d} \right)$ . Make the calculations for  $P_d = 1$ . [10]

Find the following :

- i) The values of  $q_1$  and  $q_2$ .
  - ii) The actual pressure angle  $\phi$ .
  - iii) The radii of the actual pitch circles & centre distance.
  - iv) The tooth thickness on actual pitch circle.
- Q8)** a) Explain factorial design & regression analysis. [8]
- b) Prove that reliability w.r.t. time 't' is  $R(t) = \text{Exp} \left[ - \int_0^t h(t) \cdot dt \right]$ . [8]

**Q9)** a) Why 'I' section is selected for connecting rod of high speed I.C. Engine. [6]

b) Design a piston for single acting four stroke engine with following specifications : [10]

Cylinder bore	= 0.30 m
Stroke	= 0.375 m
Max gas pressure	= 8 MPa
Brake Mean effective pressure	= 1.15 MPa
Fuel consumption	= 0.22 kg/kW/hr
Speed	= 500 rpm

**Q10)** Write a short note on the following : [18]

- Analysis of variance (ANOVA)
- Multivariable search method.
- S and S<sub>0</sub> spur gears.



Total No. of Questions : 10]

SEAT No. :

**P4008**

[Total No. of Pages : 3

**[4860] - 104**

**M.E. (Mechanical) (Design Engineering) (Semester - II)**

**ANALYSIS AND SYNTHESIS OF MECHANISMS**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer any three questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** a) Explain in detail 'Inertia forces in linkages'. **[8]**

b) How elastic mechanisms can be analyzed? **[8]**

**Q2)** a) Derive the two forms of Euler Savary equations and with sketches explain their use. **[8]**

b) A slider crank mechanism has the following specifications :  
Crank length = 3 cm, Connecting rod length = 6 cm, Offset = 1 cm,  
Crank is at 30° angle with line of stroke of slider. Construct the inflection circle using Bobillier construction. Then locate the centre of curvature of the midpoint of the connecting rod and find its radius of curvature. **[8]**

**Q3)** Explain in detail the velocity-acceleration analysis of complex mechanisms by the normal acceleration and auxiliary point method. **[16]**

**P.T.O.**

- Q4)** a) Explain the concept of ‘Transmission Angle’ as an index of performance of a 4-bar linkage.  
How is the mechanical advantage of such a linkage related with its transmission angle? [8]
- b) State and Explain the Kutzbach criterion for a special mechanisms. Apply it to a Hook’s joint to calculate its degree of freedom. [8]
- Q5)** Write a note on (ANY THREE) : [18]
- a) Types of errors
- b) Precision Points for Function Generation
- c) Cusp and Crunode
- d) Branch and Order defects
- e) Opposite pole quadrilateral.

### SECTION - II

- Q6)** Synthesize a function generator to solve the equation  $y = \frac{1}{x}$  over the range  $1 \leq X \leq 2$  using three precision positions. Draw the final sketch of linkages. [For input lever select  $30^\circ$  starting angle and  $90^\circ$  total swing angle, For the output lever select  $240^\circ$  starting angle with total swing angle of  $90^\circ$  travel] [16]
- Q7)** What is Dyad? Derive the standard form equation of Dyad. Then explain the steps involved in the synthesis of a 4 bar mechanisms with three accuracy points for the following type of problems. [16]
- a) Function generation
- b) Rigid body guidance

- Q8)** a) Explain the concept of homogeneous transformation matrix and discuss its use in positional analysis of special mechanisms. [8]  
b) Find the Denavit-Hartenberg' parameter for Hook Joint. [8]
- Q9)** a) State and prove Robert-Chebychev theorem. Comment on its use. [8]  
b) Discuss the Chebychev spacing of a accuracy points and its relation with the structural error of a synthesized mechanisms. [8]
- Q10)** Write a note on (ANY THREE) : [18]
- a) Hartmann construction.
  - b) Effective use of computer in the design of mechanisms.
  - c) Eulerian angles.
  - d) Bermester points.
  - e) Application of curvature theory to Dwell mechanisms.



Total No. of Questions : 8]

SEAT No. :

**P4009**

[Total No. of Pages : 3

**[4860] - 105**

**M.E. (Mechanical) (Design Engineering)**

**RELIABILITY ENGINEERING**

**(2008 Pattern) (Elective - III(a))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer any THREE questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Assume suitable data, if necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of non-programmable electronic calculator is allowed.*

**SECTION - I**

**Q1) a)** Explain with example : **[8]**

i) MTTF

ii) MTBF

- b) The following failure data is collected for a group of 100 LED. Find the failure density, hazard rate and reliability and plot functions to against time. **[8]**

Time Interval(Hrs.)	1	2	3	4	5	6	7	8	9	10
No. of Failures	18	16	9	8	6	7	5	8	10	13

**Q2) a)** Explain total probability theorem with example. **[8]**

**P.T.O.**

- b) Calculate the reliability for the system shown in Fig. 1. The number in each block shows the reliability of individual component. [8]

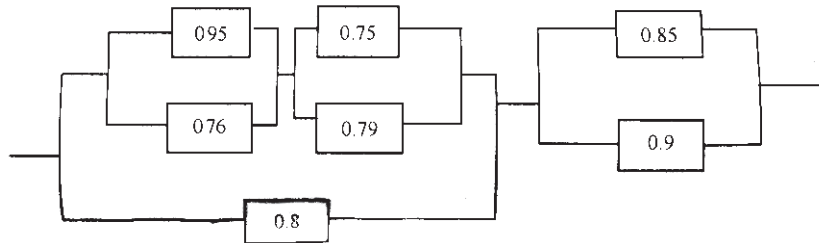


Fig.1

- Q3)** a) Explain Cut set and Tie set method for reliability. [8]  
 b) Discuss Inherent, Achieved and operational availability with practical example. [8]

- Q4)** Write short note (Any three) : [18]  
 a) Chebyshev inequality  
 b) Markov analysis  
 c) Bath tub curve  
 d) Maintainability

### SECTION - II

- Q5)** a) Explain “Reliability prediction from predicted reliability” with example. [8]  
 b) A system consists of 6 sub-systems connected in series. The reliability goal is 0.98 for period of 20 hours operation. Compute the reliability goal for each sub-system using AGREE method of allocation. [8]

Sub-system	Number of modules	Operating Modules	Importance Factor
1	40	20	1.0
2	70	18	0.98
3	40	20	1.0
4	50	16	0.95
5	65	14	0.93
6	75	20	1.0



**Q6)** a) Derive reliability equation when strength and load follows normal distribution. [8]

b) Explain with any one practical example Fault tree analysis method.[8]

**Q7)** a) Explain reliability testing with any one practical example. [8]

b) The MTTF and MTTR of four sub-systems in a system are given in the Table no. 1. Estimate the system level mean time to repair, MTTRs. [8]

Table no.1

Sub-system	MTTF	MTTR
1	320	24
2	500	36
3	240	12
4	420	08

**Q8)** Write short note (Any three) : [18]

a) Strength based reliability

b) Reliability Testing

c) Monte Carlo evaluation

d) FMEA



Total No. of Questions : 8]

SEAT No. :

**P4480**

**[4860] -106**

[Total No. of Pages :2

**M.E. (Mechanical -Design Engineering)**  
**b-ENGINEERING FRACTURE MECHANICS**  
**( 2008 Course) (Semester - II) (Elective - III) (502211-B)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Questions Nos. 4 and 8 are compulsory. Answer any two questions from each sections*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary; Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Differentiate between failure and fracture of a machine component. Also explain failure modes at macroscopic level. **[16]**

**Q2)** Explain with neat sketch the plastic zone shape and plastic constraint factor. **[16]**

**Q3)** A wide sheet of aluminium alloy has a central crack 30 mm long. If the fracture stress for the sheet is 300 MPa and yield stress of the material is 400 MPa. Calculate the fracture toughness of the material using plastic zone correction. **[16]**

**Q4)** A long pressure vessel was designed and manufactured to withstand a maximum internal pressure of 29.5 MPa. The vessel inner diameter is 1.3 m with a wall thickness of 65 mm. The material has a yield strength of 700 MPa ultrasonic inspection discovered a longitudinal surface flaw at inner diameter. The flaw has a length of 100 mm and a depth of 20mm. Determine the minimum required fracture toughness so that the vessel can operate at the design internal pressure. Estimate the critical crack depth if the plane-strain fracture toughness is 100 MPa  $\sqrt{m}$  **[18]**

**P.T.O.**

## SECTION - II

- Q5)** Explain with neat sketch time varying multiaxial loading and load spectra. [16]
- Q6)** The staircase method for fatigue limit testing was conducted on thin walled tubular specimens subjected to axial sinusoidal loading with  $R = -1$  and  $R = 0$ . The two fatigue limits are found as  $\sigma_{E, R=-1} = 700$  MPa and  $\sigma_{E, R=0} = 560$  MPa. Determine mean stress sensitivity factor  $\alpha_{\text{oct}}$  and sines stress. [16]
- Q7)** A support bracket is welded to a backing plate. A fluctuating force in the coupling rod causes a stress variation of  $\pm 50$  MPa at the weld. Calculate maximum size of defect which could be tolerated in the weld.  $\Delta K_{\text{TH}} = 1.65$  MPa  $\sqrt{m}$ . [16]
- Q8)** Explain leak before break criteria in fracture mechanics. [18]



Total No. of Questions : 8]

SEAT No. :

**P4674**

[Total No. of Pages : 2

**[4860] - 107**

**M.E. (Mechanical - Design)**

**COMPUTER AIDED ENGINEERING**

**(2008 Pattern) (Elective - III (C))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume Suitable data if necessary.*

**SECTION - I**

**Q1)** Explain the Generalized procedure in FEA in detailed steps. Define Node, Element, Domain, Continuum and Meshing. **[18]**

**Q2)** What is feature based modeling? Explain in detail. Describe Bottom Up and Top Down approach for assembly modeling with suitable example. **[16]**

**Q3)** a) What are Finite Element Method, Finite Difference Method and Finite Volume Method? Elaborate. **[8]**

b) Discuss different types of elements used in meshing in detail with their applicability. **[8]**

**Q4)** a) How Finite Element Method is better than other Numerical Techniques? Explain and List advantages and disadvantages. **[8]**

b) Define and Explain Convergence, Aspect Ratio, Warpage and Jacobian. **[8]**

**P.T.O.**

## **SECTION - II**

- Q5)** Define and Explain in detail Rotation, Reflection and Scaling in Geometric Modeling. **[18]**
- Q6)** a) What is non linearity in FEA? How it affects the solution? Explain. **[8]**  
b) Explain in detail Geometry Non Linearity and Material Non Linearity in detail. **[8]**
- Q7)** Explain the concept of Computational Fluid Dynamics in detail. What is difference between FEA and CFD from the context of application to engineering? Elaborate. List advantages of CFD. **[16]**
- Q8)** Explain in detail Model Formulation, Geometry and grid design, and boundary conditions for Computational Fluid Dynamics. Define and explain Residual. **[16]**



Total No. of Questions : 10]

SEAT No. :

**P4010**

[Total No. of Pages : 3

**[4860] - 108**

**M.E. (Mechanical) (Design Engineering)**

**VEHICLE DYNAMICS**

**(2008 Pattern) (Elective - IV(a)) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer any three questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of non-programmable electronic calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain Kinematic behavior of vehicles with rigid wheels and with compliant tires. **[8]**
- b) The sprung parts of a passenger car weigh 18 KN and the unsprung parts weigh 960 N. The combined stiffness of the suspension springs is 48.9 KN/m and that of the tires is 646 KN/m. Determine the two natural frequencies of bounce motion of the sprung and unsprung mass. **[8]**
- Q2)** a) A rear engine rear wheel drive passenger car has a mass of 1200 kg. The weight distribution on the front axle is 42 % and that on rear axle is 64 % under static condition. If cornering stiffness each of the front tires is 36 KN/rad and that of rear tires is 39 KN/rad determine the steady state handling behavior of the vehicle. If the vehicle has wheel base of 2.38 m find critical/characteristics speed of vehicle. **[8]**
- b) Explain in brief the combined pitch and bounce motion an application to multi wheel station vehicles. **[8]**

***P.T.O.***

- Q3)** a) What are test carried out for determining handling characteristics of vehicle? Explain each test in detail. [8]
- b) Explain most commonly used frequency weightings for whole-body vibration with example. [8]
- Q4)** Explain the significance of steer angle and Derive an expression for the steer angle  $\delta_f$  required to negotiate a given turn with usual notations [16]
- Q5)** Write Short Notes on : [18]
- a) Two degrees of freedom vehicle model for pitch and bounce.
- b) Characteristic and Critical speeds.
- c) effect of wheelbase in road and suspension modelling.

## SECTION - II

- Q6)** The sprung parts of a passenger car weigh 9.5 kN and the unsprung parts weigh 850 N. The combined stiffness of the suspension springs is 41.5 kN/m and that of the tires is 551.3 kN/m. Determine the two natural frequencies of bounce motion of the sprung and unsprung mass. Derive the formula used. [16]
- Q7)** A passenger car weighs 18 kN and has a wheelbase of 2.9 m. The center of gravity is 1.2 m behind the front axle and 48 cm above ground level. In practice, the vehicle encounters a variety of surfaces, with the coefficient of road adhesion ranging from 0.3 to 0.8 and the coefficient of rolling resistance of 0.016. With a view to avoiding the loss of directional stability on surfaces with a low coefficient of adhesion under emergency braking conditions, what would you recommend regarding the braking effort distribution between the front and rear axles? [16]
- Q8)** Explain with the help of labeled sketch mechanism and handling of military vehicle. [16]

- Q9)** a) Explain two degree of freedom theory to include effects of traction and braking. [8]
- b) Explain in Brief the analysis of sprocket torques and speeds, required to skid steer a tracked vehicle. [8]

**Q10)** Write short notes : [18]

- a) Steering force and moments.
- b) Types of dependent and independent suspensions.
- c) ISO Standard for Human Response to Vibrations.





Total No. of Questions : 10]

SEAT No. :

**P4011**

[Total No. of Pages : 3

**[4860] - 109**

**M.E. (Mechanical) (Design Engineering)**

**INDUSTRIAL TRIBOLOGY**

**(2008 Pattern) (Elective - IV (b))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Explain the mechanism of adhesive wear. Derive the equation for the law of adhesive wear proposed by Archad. Explain Rowe's modification of Archad equation. **[16]**

**Q2)** Discuss various types of friction and explain following theories of friction: **[16]**

- a) Coulomb's classical theory
- b) Tomlinson's theory of molecular attraction
- c) Bowden's theory of cold welded junction

**Q3)** Stating the assumptions used, derive the full Reynolds equation. **[16]**

**P.T.O.**

**Q4)** Derive an expression for load carrying capacity and oil flow rate for hydrostatic step bearing. State the assumptions made. Also write principle of working of this bearing and applications. [16]

**Q5)** Write a note on following (Any Three) : [18]

- a) Instabilities and stic-slip motion.
- b) Tribological properties of bearing materials and lubricants.
- c) Elasto-Hydrodynamic Lubrication.
- d) Foil bearings.
- e) Stress distribution in Hertzian contacts.

## SECTION - II

**Q6)** Assuming generalized Reynolds equation, derive Reynolds equation for aerodynamic bearings in dimensionless form. Explain various terms in the equation. State the advantages and limitations of air lubricated bearings. Give their applications. [16]

**Q7)** Using modified Reynolds equation for Elasto-hydrodynamic lubrication, derive Ertel Grubin equation. State limitations of this equation. [16]

**Q8)** a) Obtain an equation for time required for a circular plate to reduce film thickness from  $h_1$  to  $h_2$  while it approaches a fixed plate. [8]

b) Explain any six situations where Hydrostatic squeeze film exists. Also give advantages and limitations of squeeze film lubrication. [8]

**Q9)** a) Explain tribological aspect of rolling motion. [8]

b) Explain mechanism of tyre-road interaction. [8]

**Q10)** Write a note on following (Any Three) :

**[18]**

- a) Externally pressurized circular pad step bearing.
- b) Porous bearing.
- c) Solid lubricants and additives.
- d) Tribological aspect of drawing and extrusion.
- e) Tribological aspect of wheel on rail contact.



Total No. of Questions : 8]

SEAT No. :

**P4448**

**[4860] - 11**

[Total No. of Pages : 2

**M.E. (Civil) (Construction & Management)**

**d-PROJECT RISK ANALYSIS AND MITIGATION TECHNIQUES**

**(2008 Pattern) (Semester - I) (Elective - II) (501105)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each Section.*
- 2) *Que 1 & Que 5 are compulsory.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**SECTION - I**

- Q1)** a) Explain investment life cycle of project in details with suitable example.[4]  
b) What is NPV? Explain the standard deviation for perfectly correlated.[4]  
c) Explain discount rate method in detailed. [10]
- Q2)** a) Explain decision tree analysis. [6]  
b) Focus on utility of grading construction entities for reliable risk assessment. [10]
- Q3)** a) Explain risk profile method. [6]  
b) Write a note on identification of risk in construction of dam project.[10]
- Q4)** a) Explain the details of RAMP process. [8]  
b) What is certainty index method. Explain with example. [8]

***P.T.O.***

**SECTION - II**

- Q5)** a) What is residual risk? [8]  
b) Enlist the techniques for coverage of risk, explain any one details. [10]
- Q6)** Explain the mitigation techniques by eliminating, avoiding, pooling and transferring. [16]
- Q7)** a) Explain the Transit Insurance Policy. [8]  
b) Explain settlement of claims policy. [8]
- Q8)** a) What is mitigation of unqualified risk? Explain in brief. [8]  
b) Explain in short (BIP) - Bidding Indemnity Policy. [8]



Total No. of Questions : 10]

SEAT No. :

**P4481**

**[4860] -111**

[Total No. of Pages : 3

**M.E. (Mechanical) (Mechatronics)**  
**APPLIED NUMERICAL METHODS & COMPUTATIONAL**  
**TECHNIQUES**  
**( 2008 Course) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any three questions from each section.*
- 2) *Use separate answer book for each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** Use predictor corrector method to calculate  $y$  at  $x = 4$  with step size  $h = 2$  and initial conditions as  $y=0$  at  $x = 0$  for the differential equation **[8]**

$$\frac{dy}{dx} = 12x^2 - 20x + y^2$$

b) Compare Interpolation with regression analysis. **[8]**

**Q2) a)** 
$$\begin{bmatrix} 2.00 & -1.00 & 0.00 \\ -1.00 & 2.00 & -1.00 \\ 0.00 & -1.00 & 2.00 \end{bmatrix}$$

Compute the Eigen value and Eigen vector using power method. **[8]**

b) Discuss algorithm for Lagrange Interpolation Polynomial. **[8]**

**P.T.O.**

**Q3) a)** Discuss algorithm for Gauss quadrature for integration. [8]

b) 
$$\begin{bmatrix} 10.00 & 2.00 & -1.00 \\ -3.00 & -6.00 & 2.00 \\ 1.00 & 1.00 & 5.00 \end{bmatrix}$$

Compute L and U matrices for above matrix. [8]

**Q4) a)** Compare Simpson's One Third rule and Simpson's 3/8 rule used for numerical integration. [8]

b) Calculate inverse of the matrix in Q 3 (b) using suitable numerical method. [10]

**Q5)** Find approximate value of y at x = 4. The governing differential equation is  $dy/dx=1+xy$  with  $y(0)=2$ . [16]

Using RK 4th order method find  $y(0.1)$ ,  $y(0.2)$ .

### SECTION - II

**Q6) a)** Fit a straight line to the points (1,0.5), (2,2.5), (3,2) (4,4), (5,3.5), (6,6) and (7,5.5) using linear regression. [8]

b) Apply Lagrange's interpolation formula to find a polynomial which passes through the points (0,-20), (1,-12), (3,-20) and (4,-24). [10]

**Q7)** Solve the following set of differential equations using Improved polygon (Modified Euler's) method. Given  $x = 0$ ,  $y_1 = 4$  and  $y_2 = 6$ . Integrate to  $x = 2$  with step size  $h = 1$  [16]

$$\frac{dy_1}{dx} = 0.5y_1; \frac{dy_2}{dx} = 4 - 0.3y_2 - 0.1y_1$$

**Q8) a)** Discuss four steps of Finite Element method. [8]

b) Discuss shooting method with algorithm. [8]

- Q9)** a) Applications of Fourier Transforms in Vibration Analysis. [8]  
b) Write a short note on Implicit method to solve partial differential equations. [8]

**Q10)** Temperature of heated plate is given by

$$T(x, y) = 2xy + 2x - x^2 - 2y^2 + 72 \quad [16]$$

The plate is 0.08 m (x dimension) and 0.06 m (y dimension). Compute average temperature using trapezoidal rule with two steps along x and y axis.





Total No. of Questions : 8]

SEAT No. :

P4012

[Total No. of Pages : 2

[4860] - 112

**M.E. (Mechanical) (Mechatronics)**

**MECHANICAL & ELECTRONIC MEASUREMENTS**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer any three questions from each section.*
- 2) *Answer three questions from Section I and three questions from Section - II.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 7) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain four important characteristics of an instrument. [8]  
b) Explain volt standard in measurement. [8]
- Q2)** a) Differentiate between regression and correlation analysis. [8]  
b) Calculate correlation co-efficient from the following. [8]  
 $N = 10, \Sigma x = 350, \Sigma y = 310$   
 $\Sigma(x - 35)^2 = 162, \Sigma(y - 31)^2 = 222$   
 $\Sigma(x - 35)(y - 31) = 92$
- Q3)** a) Explain with block diagram working of logic analyzer. [8]  
b) What is Synchronous & Asynchronous mode of timing. [8]
- Q4)** a) Explain with block diagram working of spectrum analyser. [10]  
b) What are salient features of thermistors. [8]

**P.T.O.**

## SECTION - II

- Q5)** a) Explain working of any surface finish measuring instrument. [8]  
b) Explain working of vortex flow meter. [8]
- Q6)** a) Explain the working of ADC convertor. [8]  
b) Explain McLeod gauge for low pressure measurement. [8]
- Q7)** a) Explain the working of Ionisation gauge for measuring ultra low pressure. [8]  
b) Explain any one humidity measuring device. [8]
- Q8)** Write short notes on any three : [18]  
a) CMM  
b) DAC Convertor  
c) Process Control Chart  
d) RTD



Total No. of Questions : 8]

SEAT No. :

P4013

[Total No. of Pages : 3

[4860] - 114

**M.E. (Mechanical-Mechatronics)**

**DESIGN OF MACHINE ELEMENTS**

**(2008 Pattern) (Semester - I) (Elective - I(a))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer three questions from Section - I and three questions from Section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rules and electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What is weighted point method? Write the different steps involved in this method. [8]
- b) How do you classify the materials for engineering use? What are the factors to be considered for selection of materials for the design of machine elements? [8]
- Q2)** a) What is mean by endurance strength of the material? How does the size and surface condition of component and type of load affect such strength? [6]
- b) Design a cast iron protective type flange coupling to transmit 15 kW at 900r.p.m. from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used: [10]
- Shear stress for shaft, bolt and key material = 40 MPa  
Crushing stress for bolt and key = 80 MPa  
Shear stress for cast iron = 8 MPa  
Draw a neat sketch of the coupling.

**P.T.O.**

- Q3)** a) Define equivalent torsional moment and equivalent bending moment. State when these two terms are used in the design of shafts. [4]
- b) A shaft is supported by two bearings placed 1 m apart. A 600 mm diameter pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 2.25 kN. Another pulley 400 mm diameter is placed 200 mm to the left of right hand bearing and is driven with the help of electric motor and belt, which is placed horizontally to the right. The angle of contact for both the pulleys is  $180^\circ$  and  $\mu = 0.24$ . Determine the suitable diameter for a solid shaft, allowing working stress of 63 MPa in tension and 42 MPa in shear for the material of shaft. Assume that the torque on one pulley is equal to that on the other pulley. [12]

- Q4)** Write short note on the following (Any three) : [18]
- a) ASME code of shaft design.
- b) Normalizing and hardening.
- c) Maximum shear stress theory of failure.
- d) Design procedure for Bushed - pin type flexible coupling.

### SECTION - II

- Q5)** a) Explain the following terms used for helical spring : [4]
- i) Spring index.
- ii) Active Coils.
- iii) Wahls factor.
- iv) Spring Stiffness.
- b) A helical compression spring made of oil tempered carbon steel, is subjected to a load which varies from 400 N to 1000 N. The spring index is 6 and the design factor of safety is 1.25. If the yield stress in shear is 770 MPa and endurance stress in shear is 350 MPa, find: 1. Size of the spring wire, 2. Diameters of the spring, 3. Number of turns of the spring, and 4. Free length of the spring. The compression of the spring at the maximum load is 30 mm. The modulus of rigidity for the spring material may be taken as 80 kN/mm<sup>2</sup>. [12]

- Q6)** a) How do you express the life of a bearing? What is an average or median life? Explain the factors influencing the life of a bearings? [6]
- b) A single row deep groove ball bearing is subjected to a 30 seconds work cycle that consists of the following two parts : [10]

	Part I	Part II
Duration (s)	10	20
Radial load (KN)	45	15
Axial load (KN)	12.5	6.25
Speed (rpm)	720	1440

The static and dynamic load capacities of ball bearing are 50 and 68 KN respectively. Calculate the expected life of the bearing in hours.

- Q7)** a) Discuss the design procedure of spur gears. [4]
- b) A gear drive is required to transmit a maximum power of 22.5 kW. The velocity ratio is 1:2 and r.p.m. of the pinion is 200. The approximate centre distance between the shafts maybe taken as 600 mm. The teeth has 20° stub involute profiles. The static stress for the gear material(which is cast iron) may be taken as 60 MPa and face width as 10 times the module. Find the module, face width and number of teeth on each gear. Check the design for dynamic and wear loads. The deformation or dynamic factor in the Buckingham equation may be taken as 80 and the material combination factor for the wear as 1.4. [12]

- Q8)** Write short note on the following : [18]
- a) Optimum design of helical spring.
- b) Explain various types of failures in rolling contact bearings.
- c) Pitting failure its causes and remedies.



Total No. of Questions : 10]

SEAT No. :

**P4014**

[Total No. of Pages : 3

**[4860] - 115**

**M.E. (Mechanical) (Mechatronics)**  
**DIGITAL SIGNAL PROCESSING (Elective - I)**  
**(2008 Pattern) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answers any three questions from each section.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

**Q1)** a) What is sampling and quantization? Explain Nyquist rate criteria. [8]

b) Consider an analog signal. [8]

$$X_a(t) = 5 \cos(100\pi t) + 2 \sin(800\pi t) - 4 \cos(200\pi t),$$

What is the Nyquist rate for this signal? If the signal is sampled with the sampling frequency of 400Hz, what will be the DT signal obtained after sampling? What will be the recovered signal?

**Q2)** a) Find the linear convolution of the input signal  $x(n) = \{3 \ 7 \ 9 \ 5\}$  and impulse signal  $h(n) = \{1 \ 2 \ 5 \ 8\}$ . [8]

b) Determine whether each of the following systems defined below is causal, linear, dynamic, and time variant. [8]

i)  $y(n) = x^2(n)$

ii)  $y(n) = 2x + 8$

**P.T.O.**

- Q3)** a) Explain how Z transform can be used to find causality and stability of the system. Is it possible to design causal and stable system? If yes or no then give proper justification. [8]
- b) Find Z transform of the following discrete time signal and ROC for each [8]
- i)  $x(n)=\delta(n)+3\delta(n-1)-5\delta(n-2)$
- ii)  $x(n)=(n+1) u(n)$

**Q4)** Explain in detail the DIF-FFT algorithm using mathematical derivation and butterfly pattern for 8 data point. [16]

**Q5)** Write short note (any three) : [18]

- a) Comparison between Linear and Circular convolution
- b) Relation between ZT and FT
- c) Energy and power signal
- d) DTMF
- e) Power spectral density

### SECTION - II

- Q6)** a) Perform circular convolution of the following two sequences [8]  
 $X_1(n)=\{2,1,4,1\}$  and  $X_2(n)=\{5,6,2,1\}$ .
- b) Compute the DFT of the signal  $x(n)=\{3,5,1,3\}$  considering  $N=4$ . [8]

- Q7)** a) Distinguish between microprocessor and Digital signal processor. [8]
- b) With neat block diagram explain the architectural detail of DSP chip. [8]

- Q8)** a) Obtain the system transfer function of the system defined by [8]  
 $y(n)-(2/5)y(n-1)=x(n)-(7/4)x(n-1)-2/9x(n-2)$   
 Also realize the same using DF-I and DF-II methods.

- b) Give the equation for and characteristics of the following windows[8]
- i) Hanning
  - ii) Barlet window

- Q9)** a) With the help of frequency response explain BPF and BSF in detail. [8]
- b) Explain any one application of DSP in mechatronics in brief. [8]

**Q10)** Write short note on (any three) : [18]

- a) Selection criteria for any DSP processor as per application
- b) Barrel shifter
- c) Linear filtering based on DFT
- d) Modified Harvard architecture
- e) Direct form Filter structures





Total No. of Questions : 8]

SEAT No. :

P4482

[4860] -117

[Total No. of Pages :2

M.E. (Mechatronics)  
a-CONTROL SYSTEMS

(2008 Course) (Elective -II) (Semester-I) (502805 -A)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from each section.
- 2) Answer to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn whenever necessary.
- 4) Assume suitable data, if necessary.

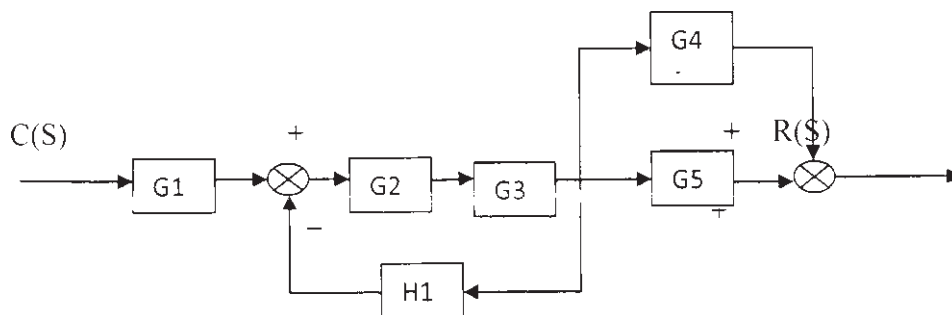
SECTION - I

Q1) a) Distinguish between the following. [8]

- i) Linear and nonlinear control systems.
- ii) Open loop and closed loop control system.

b) Reduce the following block diagram of the system shown in following figure into a single equivalent block by block diagram reduction technique.

[10]



Q2) a) What is advantage of mason gain formula? Obtain the closed loop transfer function for the above block diagram using Mason's gain formula. [10]

b) Explain the advantage of Transfer function approach of control system. [6]

Q3) a) Examine the stability by Routh's criterion for the characteristics equation.

$$S^5 + 5S^4 + 8S^3 + 6S^2 + 3S + 4 = 0 \quad [10]$$

b) Describe different test signals used in control systems. [6]

P.T.O.

**Q4) a)** The closed loop transfer function of a unity feedback control system is

$$G(S)H(S) = \frac{K}{S(S+2)(S+5)} \quad [10]$$

Sketch the root locus of the system. Determine the value K for marginal stability from the root locus.

b) What is advantage of state variable analysis? [6]

### SECTION - II

**Q5) a)** Discuss meaning of under damped and critically damped system with respect to transient response of a system. If system has open loop transfer function as [10]

$$G(S)H(S) = \frac{25}{S^2 + 6S + 25}$$

Find the delay time, peak time, and settling time.

b) Write short notes on [6]

i) Controllability

ii) Linearization

**Q6) a)** What is advantage of continuous controllers over on-off controllers? What is dead time cycling? [8]

b) Explain P, I and D controllers and explain different composite modes. [10]

**Q7) a)** A unity feedback control system has [10]

$$G(S)H(S) = \frac{80}{S(S+2)(S+20)}$$

Sketch Bode plot. Determine from it

i) Gain crossover frequency.

ii) Phase crossover frequency.

iii) Gain margin.

iv) Phase margin

v) Stability of system

b) What are adaptive control systems? With block diagram explain its operation. [6]

**Q8) a)** What is adaptive control system? Explain with suitable diagram. [8]

b) What are digital controllers? Explain with suitable diagram. [8]



M.E. (Mechanical-Mechatronics)

THEORY OF MACHINES AND MECHANISMS

( 2008 Course) (Semester - I) (502805-B) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer three questions from section I and three questions from section II.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

**SECTION - I**

- Q1)** a) What do you understand by kinematic pair? With the help of neat sketches explain different type of kinematic pair. [5]
- b) Define Inversion of a Mechanism? Explain with the help of neat sketches inversions of Double slider crankChain? Give their applications? [5]
- c) Write short notes on Robert's straight line mechanism. [6]
- Q2)** a) Explain, with the help of a neat sketch the space centrode and body centrode. [4]
- b) Fig. 01 shows the structure of whitworth quick return mechanism used in reciprocating machine tools. The various dimensions of the tool are as follows:  $OQ = 100\text{mm}$ ;  $OP = 200\text{ mm}$ ,  $RQ = 150\text{ mm}$  and  $RS = 500\text{ mm}$ . The crank  $OP$  makes an angle of  $60^\circ$  with the vertical. Determine the velocity of the slider  $S$  (cutting tool) when the crank rotates at 130 r.p.m. clockwise. Find also the angular velocity of the link  $RS$  and the velocity of the sliding block  $T$  on the slotted lever  $QT$ . [12]

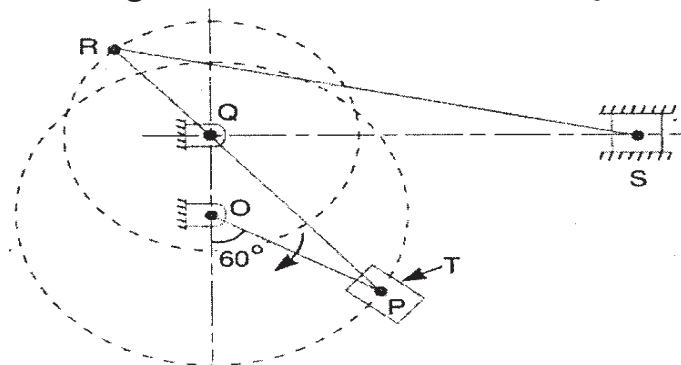


Fig. 01

**Q3) a)** In a slider crank mechanism, the length of the crank and connecting rod are 200 mm and 750 mm respectively. Find analytically, the velocity and acceleration of the piston and angular velocity & angular acceleration of connecting rod when the piston has moved through 300 mm from top dead centre position. Assume crank rotates at uniform speed of 500 rpm. [6]

**b)** The kinematic diagram of one of the cylinders of a rotary engine is shown in Fig. 02. The crank OA which is vertical and fixed, is 50 mm long. The length of the connecting rod AB is 125 mm. The line of the stroke OB is inclined at  $50^\circ$  to the vertical. The cylinders are rotating at a uniform speed of 300 r.p.m., in a clockwise direction, about the fixed centre O. Determine: 1. Acceleration of the piston inside the cylinder, and 2. Angular acceleration of the connecting rod. [12]

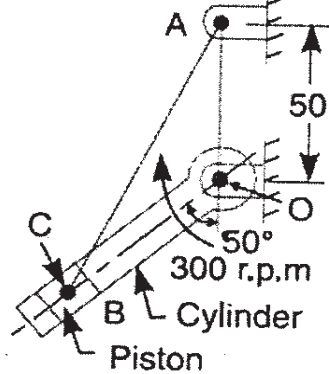


Fig. 02

**Q4) a)** What are “Chase” Solutions of a loop closure equation? How to get such a solution when magnitudes of one vector and direction of another unknown. [8]

**b)** The four bar mechanism ABCD as shown in fig. 03, which is driven by link AB at 12 r/s, counterclockwise. Find the angular velocity of link BC and DC using complex algebra method.  $AB = 50$  mm,  $CD = 56$  mm,  $AD = 100$  mm. [8]

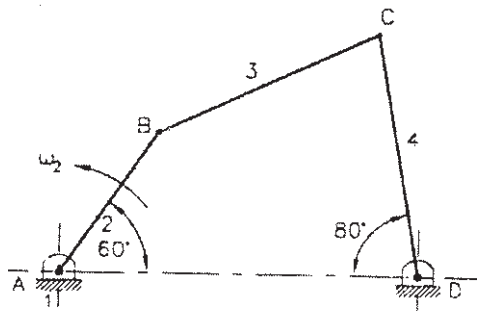


Fig. 03

## SECTION - II

- Q5) a)** Explain three position syntheses for slider crank mechanism by using Inversion method. [6]
- b) Using Freudenstein's equation, design a four bar mechanism to generate the function  $y = x^{1.5}$  for an interval in  $x$  from 1 to 4. The input link is to start from  $30^\circ$  and is to have a range of  $90^\circ$ , the output link is to start from  $90^\circ$  and is to have a range of  $90^\circ$ . Use three point Chebychev spacing. Take the length of fixed link AD as 50mm. [10]

- Q6) a)** Explain the terms longitudinal vibrations, Transverse vibrations & Torsional vibrations. [6]
- b) A flywheel is mounted on a vertical shaft as shown in Fig. 04. The both ends of the shaft are fixed and its diameter is 50 mm. The flywheel has a mass of 500 kg. Find the natural frequencies of longitudinal and transverse vibrations. Take  $E = 200 \text{ GN/m}^2$ . [10]

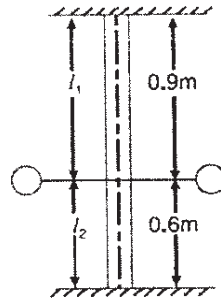


Fig. 04

- Q7) a)** Write short note Cam Jump Phenomenon. [4]
- b) A cam drives a flat reciprocating follower in the following manner: During first  $120^\circ$  rotation of the cam, follower moves outwards through a distance of 20 mm with simple harmonic motion. The follower dwells during next  $30^\circ$  of cam rotation. During next  $120^\circ$  of cam rotation, the follower moves inwards with simple harmonic motion. The follower dwells for the next  $90^\circ$  of cam rotation. The minimum radius of the cam is 25 mm. Draw the profile of the cam. [12]
- Q8) a)** Describe the concept of coupler curve synthesis with neat sketch. [6]
- b) Discuss the effect of inertia on the shaft in longitudinal and transverse vibration. [6]
- c) Derive equations for displacement velocity and acceleration for a tangent cam operating a radial translating roller follower when the contact is on the nose. [6]



Total No. of Questions : 8]

SEAT No. :

**P3958**

**[4860] - 12**

[Total No. of Pages : 2

**M.E. (Civil) (Construction and Management)**  
**CONSTRUCTION CONTRACTS ADMIN. & MGMT.**  
**(2008 Pattern)**

*Time :4 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from section-I and any 3 questions from Section-II.*
- 2) Figures to the right indicate full marks.*

**SECTION - I**

**Q1)** Explain the roles of the Owner, the Engineer and the Contractor as expected from the FIDIC document. **[18]**

**Q2)** a) Explain the contents of the Sections 73, 74 and 75 of the Indian Contract Act. **[8]**

b) Elaborate the major differences between the Indian Arbitration & Conciliation Act (1996) and the Indian Arbitration Act (1940). **[8]**

**Q3)** Discuss the benefits of :

a) e-tendering vis-a-vis conventional tendering **[4]**

b) 2 stage tendering vis-a-vis single stage tendering **[4]**

c) Negotiated tender vis-a-vis open tender **[4]**

d) Evaluated bid price (EBP) vis-a-vis lowest bid price tender **[4]**

**Q4)** Discuss 8 important causes of construction claims with a suitable example for each cause. **[16]**

**SECTION - II**

**Q5)** Discuss the provisions made in the Institutionalised Arbitration and comment on how this system is much better than the conventional adhoc system. **[18]**

**P.T.O.**

**Q6)** Differentiate with examples, between :

- a) Mediation & Conciliation [4]
- b) DRB and Arbitration [4]
- c) COPA and GCC [4]
- d) Final bill and R.A bills [4]

**Q7)** With any case study, discuss the salient features of a D.B. F.O.T contract. Also, elaborate the role of “THE INDEPENDENT ENGINEER” on such a contract. [12+4]

**Q8)** Explain with examples, the importance of :

- a) ESCROW account. [4]
- b) Contractual correspondence, documentation. [4]
- c) Accommodating exchange rate fluctuations in global bidding. [4]
- d) Problems faced in the implementation of the PPP projects in Indian Infrastructure development. [4]



Total No. of Questions : 8]

SEAT No. :

**P4484**

**[4860] -120**

[Total No. of Pages :2

**M.E. (Mechatronics) (Mechanical)  
MICROCONTROLLERS  
( 2008 Course) (Semester - II) (502808)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the architecture of 8051 with the help of block diagram. [10]  
b) Compare microprocessor and microcontroller. [8]
- Q2)** a) Explain the flag structure of 8051 in detail. [8]  
b) Explain the different addressing modes of 8051. [8]
- Q3)** a) Write a program for keyboard interfacing and explain it. [8]  
b) Explain different Timer modes of 8051. [8]
- Q4)** Write short notes on: [18]  
a) Selection criterion of microcontroller.  
b) Power saving mode  
c) Logic Analyzer

***P.T.O.***



**SECTION - II**

- Q5)** a) Explain in detail interfacing of 8 bit DAC to 8051. [9]  
b) Explain the memory organization of 8051. [9]
- Q6)** a) State the different features of PIC microcontroller. [8]  
b) Enlist the applications of ARM processor and explain any one. [8]
- Q7)** a) Explain PSW register in 8051. [8]  
b) Compare RISC and CISC processor. [8]
- Q8)** a) Write a note on SPI bus. [8]  
b) Compare RS 232 and RS 485. [8]



Total No. of Questions : 10]

SEAT No. :

P4485

[4860] -121

[Total No. of Pages : 3

**M.E. (Mechanical) (Mechatronics)**  
**INDUSTRIAL AUTOMATION**  
**( 2008 Course) (Semester - II) (502809)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Solve any three questions from each section.
- 2) Use separate answer book for each section.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Use of calculator is allowed.
- 6) Assume suitable data, if necessary.

**SECTION - I**

- Q1)** a) Compare ladder logic and contactor (Relay) Logic in programming. Explain the symbols used in PLC programming with significance. [8]  
b) Compare Timers and counters with respect to PLC programming. Write the PLC blocks used, with significance of all the terms used in the block. [8]
- Q2)** a) Write a PLC program for direction control of DC motor with unipolar power supply. Write Boolean equations of all the rungs you write. [8]  
b) Explain the Count Up and Count Down, programming instructions used in PLC programming. Write the PLC programming block and describe the importance of all the terms used in the block. [8]
- Q3)** Develop ladder program for the following industrial objective. Given START, STOP, UP and DOWN buttons are push-to-on momentary switches. LS1 and LS2 are limit switches of NC type. The motor M1 is employed to take the platform up and motor M2 is used to take the platform down. Figure Q3 shows the details.

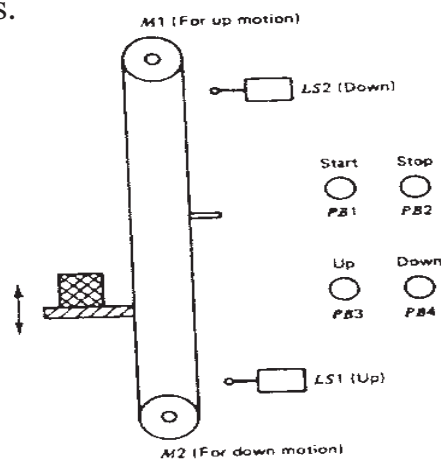


Figure Q3

P.T.O.

- a) When START button is pushed the platform shall move downwards if not at bottom.
- b) When STOP button is pushed the platform shall stop where it is.
- c) When UP button is pushed the platform shall move upward if it is not going down.
- d) When DOWN button is pushed the platform shall move downwards if it is not going up.

Write the PLC program for objectives (a) to (d) individually and then write the complete program. [18]

- Q4)** a) Explain working of PLC with Block Diagram. [8]
- b) Describe types of timers used in PLC programing. [8]

**Q5)** Write a PLC program for conveyor, with START, Emergency STOP buttons, to convey 4 objects from 'InLoc' to 'OutLoc' and stop till next time START is pushed. The conveyor has DC drive motor and proximity switches at both 'InLoc' and 'OutLoc'. Clearly mention all the assumptions you make and write Boolean equations for all the rungs you write. [16]

### SECTION - II

- Q6)** a) Explain the significance of absolute coordinates and incremental coordinates with suitable example. [8]
- b) Write a short note on APT Programming. [8]

- Q7)** a) Explain any three Machine control codes used in CNC programming with suitable application. [8]
- b) Explain the full form of G codes for linear interpolation and circular interpolation. [8]

- Q8)** a) Explain advantages and limitations of CNC with conventional machine tools with three illustrations. [8]
- b) Write a CNC program for taper turning. Assume suitable diameters and length of Job. [8]

**Q9)** Figure Q9 shows a profile for turning job. Prepare a NC part program, mention all the assumptions including raw material dimensions. Write the program in TAB sequential format. Do not use special canned cycles. **[18]**

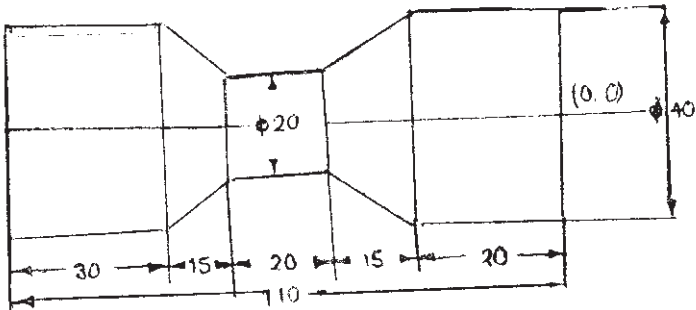


Figure Q9

- Q10)a)** Discuss in brief tool offset and wear offset in CNC programming. **[8]**
- b)** Explain Linear and circular interpolation used in CNC programming. **[8]**



Total No. of Questions :[ 10]

SEAT No. :

**P4486**

**[4860]-122**

[Total No. of Pages :2

**M.E.(Mechanical)(Mechatronics)**  
**DRIVES AND ACTUATORS**  
**(2008 Course) (Semester-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from section I and three questions from section II. Q No.5 and QNo.10 is compulsory..*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Discuss the IGBT working its transfer and static V-I characteristics. [8]  
b) Explain in detail, constant power and constant drive characteristics for DC compound motor. [8]
- Q2)** a) Describe the construction and four quadrant modes of operation a triac. [8]  
b) What do you mean by an Electrical drive. Compare AC and DC drive. [8]
- Q3)** a) Explain driver circuit used for a stepper motor. [8]  
b) Explain working of brushless DC motor. Compare brushless DC motor and conventional DC motor. [8]
- Q4)** a) Explain three phase bridge inverter. [8]  
b) Explain the static scherbius drive for speed control of induction motor. [8]
- Q5)** Write a short note on (any three). [18]
- a) Two transistor analogy of SCR.
  - b) Variable reluctance stepper motor.
  - c) Single phase fully controlled converter.
  - d) N channel E-MOSFET.

**P.T.O.**

## SECTION-II

- Q6)** a) Draw a neat sketch and discuss the operation of non-return valve. [8]
- b) Discuss the use of resolvers in a feedback loop. [8]
- Q7)** a) Give the advantages, disadvantages and applications of Hydraulic systems and pneumatic systems. [8]
- b) Using a neat labeled sketch discuss the operation of solenoid actuator. [8]
- Q8)** a) Discuss the “Ultimate Gain Technique” for tuning of the gains of a PID control. [8]
- b) Using a neat labeled sketch discuss, in detail, the use of control valve in reciprocating circuit. [8]
- Q9)** a) Explain counter balance circuit w.r.t hydraulic circuit, working and industrial application. [8]
- b) Explain the operation of an electro-hydraulic actuator. [8]
- Q10)** Write short note on (any three). [18]
- a) Piezoelectric actuator.
- b) Encoder.
- c) Classification of valves.
- d) Hall resolver



Total No. of Questions : 10]

SEAT No. :

**P4015**

[Total No. of Pages : 2

**[4860] - 123**

**M.E. (Mechanical) (Mechatronics)**  
**(CAD) COMPUTERAIDED DESIGN (Elective - III)**  
**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Attempt any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of Electronic pocket Calculator is allowed.*
- 6) *Assume suitable data, if necessary and mention it clearly.*

**SECTION - I**

- Q1)** a) Explain the CAD product life cycle management. [8]  
b) Explain the role of quality function deployment in product design.[8]
- Q2)** a) A polygon ABCD with vertices A (50, 20), B (70, 20), C (60, 40) and D (50,30) is to be scaled by a factor of 0.5 about arbitrary point X (10, 10). Determine. [8]  
i) Composite transformation matrix  
ii) Coordinate of the vertices for a scaled triangle  
b) Explain graphics standards used in CAD. [8]
- Q3)** a) Explain the role of homogeneous transformation matrices in computer graphics. [8]  
b) Derive and Explain the parametric representation of line. [8]

***P.T.O.***

- Q4)** a) Differentiate between surface and solid modeling techniques. [6]  
b) Discuss the parametric representation of cubic spline curve. State Advantages over Bezier Curve. [10]

- Q5)** a) Constrained based solid modeling technique. [6]  
b) Primitive instancing Techniques. [6]  
c) Classification of geometric modeling techniques. [6]

## SECTION - II

- Q6)** a) Explain FEA procedure. [6]  
b) Role of shape functions in FEA. [6]  
c) Explain kinematic analysis procedure used FEA. [6]

- Q7)** a) Explain need of boundary conditions used in FEA. [8]  
b) Explain the principle and working of fused deposition modeling technique. [8]

- Q8)** a) Explain design for Assembly with suitable example. [8]  
b) Explain FDM rapid prototyping technique in detail. [8]

- Q9)** a) Applications of rapid prototyping in product design. [8]  
b) Explain the type of errors occur during random number generation, Elaborate. [8]

- Q10)** a) Explain role of simulation in engineering in context of CAD and CAE. [8]  
b) Compare different RP techniques. [8]





Total No. of Questions : 10]

SEAT No. :

P4016

[Total No. of Pages : 3

[4860]-124

M.E. (Mechanical) (Mechatronics)

ROBOTICS

(2008 Pattern) (Elective - III (b))

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any THREE questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of pocket non programmable electronic calculator is allowed.*

**SECTION - I**

- Q1)** a) Discuss Lagrange-Eular Formulation for robotic manipulator. [8]  
b) Explain the different parameters to be considered during planning of joint trajectories. [8]
- Q2)** a) Suggest suitable Gripper used for painting applications and explain its construction and working. [8]  
b) Find the resultant rotation matrix for Euler's angle representation in following sequence of rotation. [8]  
i) Rotation by an angle  $\phi$  about OX axis  
ii) Rotation by an angle  $\theta$  about OU axis  
iii) Rotation by an angle  $\psi$  about OW axis
- Q3)** a) Define Spatial and Control resolution with respect to robots precision of movement. [8]  
b) Explain pneumatic drive used in robotic joints. [8]

*P.T.O.*

- Q4)** a) Enlist prominent features of the grippers used in robots. [8]  
 b) A part weighing 20 kg to be held by a gripper using friction against two opposing fingers. Compute the gripper force if coefficient of friction between the fingers and the part surface is 0.25. [8]

- Q5)** a) A Manipulator is required to move along a straight line from point *A* to Point *B* rotating at constant angular velocity about a vector *K* and at an angle *O*. The points *A* and *B* are given by a  $4 \times 4$  homogeneous transformation matrices as [10]

$$A = \begin{bmatrix} -1 & 0 & 0 & 10 \\ 0 & 1 & 0 & 10 \\ 0 & 0 & 1 & 10 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 0 & -1 & 0 & 10 \\ 0 & 0 & 1 & 30 \\ -1 & 0 & 0 & 10 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

- b) Explain all D-H Parameters with suitable sketch. [8]

### SECTION - II

- Q6)** a) Sketch and explain the terms path points, via points and pseudo via points with suitable example. [8]  
 b) Discuss the encoders used as feedback sensors in robot joints. [8]

- Q7)** a) Explain VAL II Robot Programming Language. [8]  
 b) It is desired to have the first joint of a six axis robot go from initial angle of  $30^\circ$  to a final angle of  $60^\circ$  in 4 seconds. Use third order polynomial to calculate joint angles at 1, 2 and 3 seconds. [8]

- Q8)** a) Compare between lead-through and teach pendent programming methods. [8]  
 b) Explain Image data reduction and segmentation with respect to machine vision system. [8]

- Q9)** a) Classify and explain WAIT, DELAY, SIGNAL, CLOSE, OPEN and MOVE commands used in Robot Programming. [12]  
 b) Explain the various points to be considered during selection of sensors. [4]

**Q10)** Write short notes on (Any three) :

**[3 × 6 = 18]**

- a) Compare joint space scheme with Cartesian space scheme.
- b) Robot Applications in Assembly
- c) Levels of robot programming.
- d) Recent developments in robotics.



Total No. of Questions : [ 10]

SEAT No. :

**P4487**

**[4860]-125**

[Total No. of Pages :2

**M.E.(Mechanical)(Mechatronics)**  
**c-AUTOMOTIVE ELECTRONICS(Elective-III)**  
**(502811) (2008 Course) (Semester-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any three questions from each section.*
- 2) *Use separate answer book for each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Discuss the electronics involved in head lamps in modern automobiles. [8]  
b) Sensors used in wheel alignment and balancing of wheels. [8]
- Q2)** a) Describe in brief the Anti-Fog system in automobiles. [8]  
b) Describe sensors used in automated Parking. [8]
- Q3)** a) Discuss the controls used in automotive air conditioning. [8]  
b) Explain controls used in automotive heating system. [8]
- Q4)** a) Describe the components involved, the functions thereof involved in electronic fuel injection system. [10]  
b) Enumerate the advantages of microprocessors used in automobiles. [8]
- Q5)** a) Discuss recent trends in power windows. [8]  
b) Compare 8 bit microprocessors and 16 bit microprocessors in Luxury cars. [8]

**SECTION-II**

- Q6)** a) Describe electronic injection advance in compression. Ignition engines. [8]  
b) Discuss antilock braking system. [8]

*P.T.O.*

- Q7)** a) Describe automobile battery with respect to types, recent trends, protections. [8]
- b) Compare microprocessor assisted engine cooling system with fan driven by crank shaft. [10]
- Q8)** a) Write short note on multipoint fuel injection systems in spark Ignition engines. [8]
- b) Explain throttle position sensor and its advantages. [8]
- Q9)** a) The sensors, controls, and displays employed in automobile speed measurement. [8]
- b) Discuss modern wiper system over conventional one speed wiper system. [8]
- Q10)** a) Discuss the battery tests. [8]
- b) Discuss diesel engine control system with representative block diagram. [8]



Total No. of Questions : 8]

SEAT No. :

**P4488**

**[4860]-126**

[Total No. of Pages :2

**M.E.(Mechanical)(Mechatronics)**

**EMBEDDED SYSTEMS**

**(502812(A)) (2008 Course) (Semester-II)(Elective-IV)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, wherever necessary.*

**SECTION-I**

- Q1)** a) Define embedded systems.Explain its applications. [8]  
b) What are the processor and IC technology used in embedded system design? [10]
- Q2)** a) What are the different selection criteria of microprocessor in embedded system? [8]  
b) Explain the role of interrupts in embedded systems. [8]
- Q3)** a) Explain communication using 12C bus briefly.What are its features? [8]  
b) Explain the features of USB bus and communication using USB bus.[8]
- Q4)** a) What are different types of memories? Explain address, data and control bus. [8]  
b) How different Input/Output devices can be interfaced with processor using DMA and Interrupt method? [8]

**P.T.O.**

## SECTION-II

- Q5)** a) Explain round robin software architecture in detail. [8]
- b) What is operating system and explain its features and application. [10]
- Q6)** a) What is the difference between real time operating systems and other OS? [8]
- b) What are the different task states? How task states are changed? [8]
- Q7)** a) What is application of semaphores in shared data problem? [8]
- b) Explain the function of mail box and message queue in operating system. [8]
- Q8)** a) Write short note on (any one). [8]
- i) Bluetooth.
- ii) Zigbee.
- b) With the help of suitable diagram explain the design of Robot arm. [8]



Total No. of Questions : 8]

SEAT No. :

P3959

[4860] - 13

[Total No. of Pages : 3

**M.E. (Civil) (Construction and Management)**  
**PROJECT ECONOMICS & FINANCIAL MANAGEMENT**  
**(2008 Pattern)**

*Time :4 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from each section.*
- 2) Figures to the right indicate full marks.*

**SECTION - I**

**Q1)** Determine  $NPV_{(12)}$  for the following Investment proposal and decide whether it is worth to invest. **[18]**

Year	Annual cash Inflows (Rs)	Annual Cash Outflows (Rs)
1	10,00,000	75,00,000
2	20,00,000	10,00,000
3	45,00,000	20,00,000
4	60,00,000	5,00,000
5	40,00,000	30,00,000

**Q2)** For the data table given in question 1, if the expected IRR is at 8%, determine the IRR generated based on minimum 3 trials, and decide whether it is worth to invest, based on IRR concept. **[16]**

**Q3)** Compare following project alternatives based on the (PBP). **[16]**

Project A → Initial Investment → Rs 10 crores

Project B → Initial Investment → Rs 5 crores

Project C → Initial Investment → Rs 15 crores

Cash inflows of the 3 projects are as under : -

**P.T.O.**



Year	Project A (Rs crores)	Project B (Rs Crores)	Project C Rs Crores
1	2	–	–
2	3	2	1
3	3	3	2
4	3	3	3
5	2	1.5	5
6	1	0.5	7

- Q4)** For the data table given in problem (3) Determine the ARR for all the 3 projects and compare the proposals if the tax is to be considered at 15% and depreciation is to be considered at 10%. **[16]**

### SECTION - II

- Q5)** Compare and contrast between - **[18]**

- a) Equity Shares – Preference Shares
- b) Micro finance – Major Finance
- c) Tax free bonds – Debenture Capital
- d) Escrow Account – Conventional Account

- Q6)** Evaluate the combined portfolio risk and return characteristics for the following options :- **[16]**

- a) Portfolio of land investments, share market investments, Gold investments

with W = 50 : 30 : 20

% Risk = 15 : 20 : 10

% Returns = 18 : 32 : 20

Also when the land investments increase by 10%, the gold market falls by 5% whereas the shares market is unaffected.

- b) Portfolio of construction, fixed deposits, Plant and Machinery

with W = 60 : 20 : 20

% Risk = 20 : 5 : 10

% Returns = 35 : 12 : 18

There is no correlation between the 3 investments. The investor has decided to invest a total amount of 100 crores. Suggest with calculations, in which portfolio should the investor invest and why?

**Q7)** Elaborate on how standard deviation is determined for measuring the financial risk of any investment. Also explain scenario analysis and sensitivity analysis as financial risk evaluation tools. **[8+4+4]**

**Q8)** Discuss the following with examples :

- a) Double - declining balance method of depreciation. **[4]**
- b) Balance sheet contents. **[4]**
- c) Financial Ratios-importance. **[4]**
- d) Time value of money-Applications. **[4]**



Total No. of Questions : 08]

SEAT No. :

**P4489**

**[4860]-130**

[Total No. of Pages :2

**M.E.(Mechanical-Automotive Engineering)**

**AUTOMOTIVE ENGINE DESIGN**

**(2008 Course) (Semester-I)(502301)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Question Nos.4 and 8 are compulsory, Answer any two questions from each sections.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary; figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** Explain the equivalent conditions in similar engines? Under equivalent conditions list properties of theoretically similar engines. **[16]**
- Q2)** List and explain factors to be considered in general engine design. **[16]**
- Q3)** Draw a neat sketch of trunk type I C engine piston. **[16]**
- Q4)** A four-cylinder automotive spark-ignition square engine is being designed to provide a maximum brake torque of 100N-m in the mid-speed range(=3000 rev/min). Estimate the required engine displacement, bore and stroke, and the maximum brake power the engine will deliver. Assume bmep at the maximum engine torque point is 800 kPa and maximum mean piston speed, 10 m/s. **[18]**

**SECTION-II**

- Q5)** Stresses recorded at a highly stressed point on crankshaft undergoing cyclic loading are  $\sigma_{\max}=200\text{MPa}$  and  $\sigma_{\min}=-100\text{MPa}$ . For the material,  $S_{ut}=500\text{MPa}$ ,  $S_y=300\text{MPa}$ , a fully corrected endurance limit,  $S_e=200\text{MPa}$ , and  $f=0.85$ . Estimate the number of cycles to a fatigue failure using:
- a) Modified goodman criterion.
  - b) Gerber criterion **[16]**

**P.T.O.**

**Q6)** The design diagram of a camshaft can be considered as a free two-support beam loaded where the follower exerts maximum force of 1500 N on the cam at distance of 25mm from left support.Length of camshaft span in 100mm, outer diameter of camshaft is 25mm and inner diameter is 12mm.Find maximum deflection of camshaft.Take  $E=210\text{GPa}$ . **[16]**

**Q7)** A multi-cylinder engine is to run at a constant load at a speed of 1000rpm.Dimensions of the cast iron flywheel rim are, breadth=125mm,radial thickness=50mm and mass is 100kg.The density of cast iron is  $7355\text{Kg/m}^3$ , and its allowable stress in tension is 40MPa.Find factor of safety considering stress due to centrifugal force. **[16]**

**Q8)** List and explain with neat sketch the steps for the force analysis of reciprocating and rotating masses of IC engine considering inertia effects.**[18]**



Total No. of Questions : 12]

SEAT No. :

**P4664**

[Total No. of Pages : 2

**[4860] - 131**

**M.E. (Mechanical) (Common to all branches)  
TECHNOLOGY & FINANCIAL MANAGEMENT  
(2008 Pattern) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from each section in separate answer books.*
- 2) *Use of calculators is allowed.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume suitable data if necessary.*

**SECTION - I**

**Q1) a)** Discuss in brief the sources of short-term Finance. **[8]**

b) Explain Investment Decision and Financing Decision. **[8]**

OR

**Q2) a)** Discuss in brief Sales Budget and Production Budget. **[8]**

b) Explain in brief the advantages and limitations of Budgeting. **[8]**

**Q3) a)** Explain the techniques of activity based costing and state its importance. **[8]**

b) Differentiate between cost estimation and cost accounting. What are methods of costing? **[10]**

OR

**Q4) a)** Explain Labor cost and Material cost with respect to Elements of Cost. **[8]**

b) Discuss Break-even Analysis w.r.t. Assumptions in Break even formula, break even point and margin of safety. **[10]**

**Q5) a)** Discuss in brief the law of reducing returns. **[8]**

b) Explain in brief the causes of inflation. **[8]**

OR

**P.T.O.**

- Q6)** Explain the following in brief (any two) : **[16]**
- a) Compare Internal and International Trade.
  - b) Types of Unemployment.
  - c) Types of Competitions.

**SECTION - II**

- Q7)** a) Define Total Quality Management? What are the elements and principle of TQM. **[9]**
- b) Define JIT Production system. Explain the pre-requisites of implementing JIT. **[9]**

OR

- Q8)** a) Explain the role of Quality Standards with reference to ISO9000 series in manufacturing industries. **[9]**
- b) What is Quality Planning, Quality Control and Quality improvement? **[9]**

- Q9)** a) Discuss the significance of Project Life Cycle. **[8]**
- b) Explain difficulties and applications of Network Techniques. **[8]**

OR

- Q10)** a) Explain the rules for drawing network diagram on Project Management? **[8]**
- b) Explain Planning and Scheduling as phases of Project Management. **[8]**

- Q11)** a) Differentiate between Personnel Management and HR Management. **[8]**
- b) Explain the estimation of Manpower requirement. **[8]**

OR

- Q12)** a) Discuss in brief the objectives of Manpower planning. **[8]**
- b) Explain the methods to identify training needs analysis and needs of training. **[8]**



Total No. of Questions : 08]

SEAT No. :

**P4490**

**[4860]-132**

[Total No. of Pages :3

**M.E.(Mechanical)(Automotive Engg.)**

**ADVANCED HEAT TRANSFER**

**(502302(A)) (2008 Pattern) (Semester-I)(Elective-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) What is meant by thermal contact resistance? Upon what parameter does this resistance depends? **[8]**
- b) An ice chest is constructed of Styrofoam ( $k=0.033 \text{ W/m}^\circ\text{C}$ ) with the inside dimensions of  $25 \times 40 \times 100 \text{ cm}$ . The wall thickness is  $5.0 \text{ cm}$ . The outside of the chest is exposed to air at  $25^\circ\text{C}$  with  $h=10 \text{ W/m}^2 \text{ }^\circ\text{C}$ . If the chest is completely filled with ice, calculate the time for the ice to completely melt. State you assumption. The heat of fusion for water is  $330 \text{ kJ/kg}$ . **[8]**
- Q2)** a) A circumferential fin of rectangular profile is constructed of a material having  $k=55 \text{ W/m }^\circ\text{C}$  and is installed on a tube having diameter of  $3 \text{ cm}$ . The length fin is  $3 \text{ cm}$  and thickness is  $2 \text{ mm}$ . If the fin is exposed to a convection environment  $23^\circ\text{C}$  with  $h=68 \text{ W/m}^2 \text{ }^\circ\text{C}$  and the tube wall temperature is  $100^\circ\text{C}$ . Calculate the heat loss by the fin. **[8]**
- b) What is lumped capacity? What are the different approaches to solve transient heat transfer problems? **[8]**
- Q3)** Write notes on (any three). **[18]**
- a) Navier-stokes equation.
  - b) Reynolds and Chilton-Colburn analogies.
  - c) Single phase convective heat transfer correlations.
  - d) Effect of boundary layer in convective heat transfer.

**P.T.O.**

- Q4) a)** Distinguish between differential and integral analysis of boundary layer flows. [8]
- b) What is energy and momentum equation for the laminar boundary layer on a flat plate? What assumptions are involved in the derivation of this equation? [8]

### SECTION-II

- Q5) a)** Explain briefly the condensation mechanism and differentiate between dropwise and filmwise condensation. [8]
- b) A vertical plate 350mm high and 420mm wide, at 40 °C, is exposed to saturated steam at 1 atm. Calculate the following. [10]
- i) The film thickness at the bottom of the plate.
  - ii) The maximum velocity at the bottom of the plate.
  - iii) The total heat flux to the plate.

Assume vapour density is small compared to that of the condensate.

- Q6) a)** Define shape factor and derive the expression for it in case of radiation heat exchange between two surfaces. [8]
- b) Determine the number of shields required to keep the temperature of the outside surface of a hollow brick lining of a furnace at 100°C when the temperature of the inside surface of the lining is 500°C. Taken the emissivity of brick lining as well as for shield as 0.87.  
Heat transfer to the surroundings from the outer surface takes place by radiation and convection. The heat transfer coefficient for natural convection is given by  $h_a = 1.44(T_{\text{surface}} - T_{\text{surrounding}})^{0.33} \text{ W/m}^2 \text{ } ^\circ\text{C}$ ,  $T_{\text{surrounding}} = 25 \text{ } ^\circ\text{C}$ . Neglect heat transfer by convection and conduction between the brick linings. [8]



- Q7) a)** Write a short note on. **[8]**
- i) Liquid cooling system for electronic components.
  - ii) Thermo electric cooling
- b) A feed water heater which supplies hot water to a boiler comprises a shell and tube heat exchanger with one shell pass and two tube passes. One hundred thin walled tubes each of 20mm diameter and length of 2m per pass are used. Under normal operating conditions, water enters the tubes at 10 kg/s and 17°C and is heated by condensing saturated steam at 1 atm. on the outer surface of the tubes. The convection coefficient of saturated steam is 10kW/m<sup>2</sup> °C. Determine the water exit temperature. **[8]**
- Use the following properties of water  
 $C_p = 4.18 \text{ kJ/kg } ^\circ\text{C}$ ,  $\mu = 0.596 \times 10^{-3} \text{ Ns/m}^2$ ,  $k = 0.635 \text{ W/m } ^\circ\text{C}$ ,  $\text{Pr} = 3.93$

- Q8) a)** Write a short note on **[8]**
- i) Shape factor algebra.
  - ii) Forced convection boiling.
- b) Derive the expression of LMTD for counter flow heat exchanger. Write its assumptions. **[8]**



Total No. of Questions : 9]

SEAT No. :

**P4491**

**[4860] - 133**

[Total No. of Pages : 3

**M.E. (Mechanical Engineering - Automotive Engineering)**

**b - FINITE ELEMENT METHOD**

**(2008 Course) (Semester - I) (Elective - I)**

*Time : 3 Hours]*

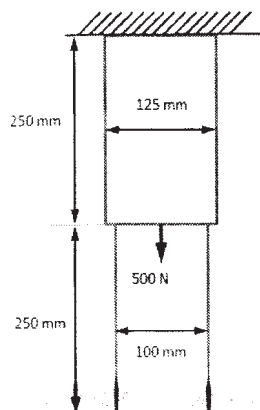
*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from each section.*
- 2) *Answer to the each section should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume Suitable data, if required.*

**SECTION - I**

- Q1) a)** Give details of step by step procedure adopted in Finite element method. **[6]**
- b) The thin plate of uniform thickness 25 mm is as shown in Figure. In addition to the self-weight, the plate is subjected to a point load of 500 N at mid-depth. The Young's modulus  $E = 2.5 \times 10^5 \text{ N/mm}^2$  and unit weight  $\rho = 8 \times 10^{-4} \text{ N/mm}^2$ . Analyse the plate after modelling it with two elements and find the stresses in each element. **[10]**



- Q2) a)** Explain difference between finite element method and finite difference method. **[6]**
- b) Write a note on Panelty Approach and Elimination Approach? **[6]**
- c) Explain Weighted residual method used in FEA. **[6]**

**P.T.O.**

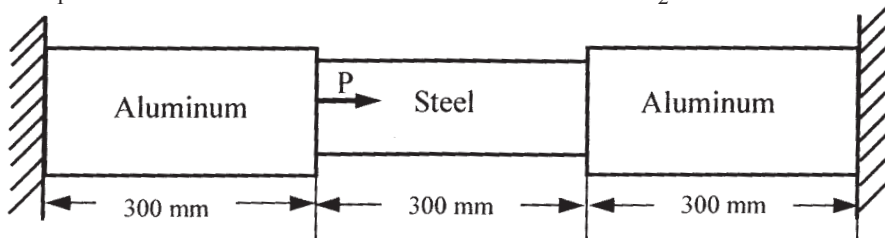
- Q3) a)** Determine the nodal displacements at all node, stresses in each material and support reactions in the bar shown in figure, due to applied force  $P = 150 \times 10^3 \text{ N}$  and temperature rise of  $50^\circ\text{C}$ . Given :

$$A_1 = 2400 \text{ mm}^2 \quad A_2 = 1200 \text{ mm}^2 \quad A_3 = 1200 \text{ mm}^2$$

$$l_1 = 300 \text{ mm} \quad l_2 = 300 \text{ mm}, \quad l_3 = 300 \text{ mm}$$

$$E_1 = 0.7 \times 10^5 \text{ N/mm}^2 \quad E_2 = 2 \times 10^5 \text{ N/mm}^2$$

$$\alpha_1 = 22 \times 10^{-6}/^\circ\text{C}, \quad \alpha_2 = 12 \times 10^{-6}/^\circ\text{C} \quad [10]$$



- b) What is meant by P-type element used in FEA? Explain linear quadratic element. [6]

- Q4) a)** Application of plane stress and plane strain elements and its analysis procedure. [8]
- b) Explain the terms isoparametric, subparametric and superparametric elements. [10]

## SECTION - II

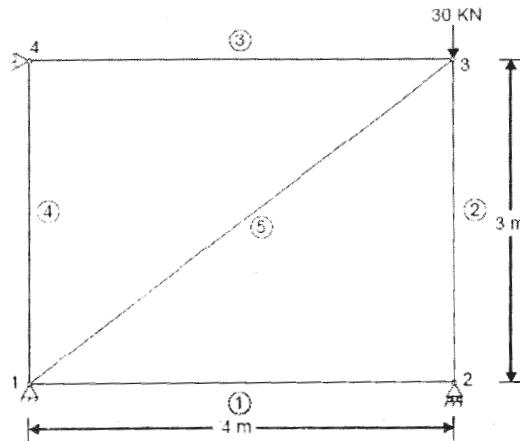
- Q5) a)** Explain the different types of non-linearities encountered in structural analysis. [4]
- b) Name some of the standard FEA packages. And Write short note on pre and post processors used in FEA packages. [6]
- c) Derive the shape function Constant Strain Triangular element. [6]
- Q6) a)** How pascal triangle is used to determine a polynomial explain its significance. Explain concept of CST (Constant Strain Triangle) and LST (Linear Strain Triangle). [8]
- b) Explain “Higher order element Vs Refined Mesh”. [8]

**Q7) a)** What is meant by displacement function? Write down convergence criteria for Finite Element Analysis. [8]

b) Using generalized coordinate approach, find shape functions for two noded bar/truss element. [8]

**Q8) a)** Obtain the forces in the plane truss shown in Figure and determine the support reactions also. [10]

Use finite element method. Take  $E = 215 \text{ GPa}$  and  $A = 2000 \text{ mm}^2$ .



b) What is Axis Symmetric Element? and Explain with suitable example. [6]

**Q9)** Attempt any three: [18]

a) Write short notes on:

i) Effect of element aspect ratio on accuracy.

ii) Numbering nodes for band width minimization.

b) Write short notes on CST Element.

c) Nonlinearities in FEA packages.

d) Axis symmetry and symmetric elements.



Total No. of Questions : 8]

SEAT No. :

P4017

[Total No. of Pages : 2

[4860]-134

**M.E. (Mechanical) (Automotive Engineering)**

**ADVANCED HYDRAULICS & PNEUMATIC SYSTEMS (Elective - I)  
(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any THREE questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Draw a hydraulic system used in an automobile mentioning the use of the components in it. [8]  
b) Describe the types and materials used for packing and seals. [8]
- Q2)** a) Give application of a dual pump used in automobile systems. [8]  
b) Explain with circuits the application of accumulators as - [8]  
i) Power saving device.  
ii) Hydraulic shock absorber device.
- Q3)** a) A hydraulic system requires the following working cycle.  
i) Forward fast approach - 200 mm.  
ii) Forward feed stroke - 200 mm.  
iii) Return stroke - 400 mm.  
Forward stroke is adjustable. Draw a suitable circuit and explain its working to achieve above requirements. [12]  
b) What are the characteristics of a positive displacement pump? [6]

**P.T.O.**

- Q4)** a) What are proportional and cartridge valves. Explain in brief. [8]  
b) Explain any two applications of pneumatics in automobiles. [8]

### **SECTION - II**

- Q5)** a) Classify flow control valves. Compare the different types of speed control methods with circuits. [8]  
b) What are the advantages of pilot operated systems? Explain any typical pilot operated pneumatic circuit. [8]

- Q6)** a) Explain FRL unit used in pneumatic system. [6]  
b) Explain twin pressure and shuttle valves with the help of circuits. State their applications. [10]

- Q7)** a) A pneumatic system has 2 cylinders. The sequence of their operation is as follows -. [8]  
i) Cylinder '1' extends  
ii) Cylinder '2' extends  
iii) Cylinder '2' retracts  
iv) Cylinder '1' retracts  
Draw a pneumatic circuit without using solenoid operated valves.  
b) Explain with the help of suitable circuits how synchronizing movement of hydraulic rams is obtained. [8]

- Q8)** Answer any three of the following : [18]  
a) Fluid sensors in pneumatic system.  
b) Describe MPL control system.  
c) Basic Fluidic devices.  
d) Remote control pneumatic system.



Total No. of Questions : 8]

SEAT No. :

P4018

[Total No. of Pages : 2

[4860]-135

**M.E. (Mechanical) (Automotive Engineering)**  
**TRIBOLOGY AND PREVENTIVE MAINTANENCE**  
**(2008 Pattern) (Elective - II) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any THREE questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Your answers will be valued as a whole.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What is importance of engine tribology? Explain tribological considerations in design of gears. **[8]**  
b) Explain different lubrication regims in the engine with stribeck curve. **[8]**
- Q2)** a) Explain deformation theory of friction and derive an expression for coefficient of friction due to deformation. **[8]**  
b) Explain Archard's theory of wear and derive Archard's Wear Equation with usual notations. **[8]**
- Q3)** a) Derive an expression for two dimensional Reynold's equation for hydrodynamic lubrication. State the assumptions made. **[10]**  
b) Explain standard methods for testing of automotive lubricants. **[8]**
- Q4)** Write short note on : **[16]**  
a) Automatic transmission fluid  
b) Ferrography  
c) Factors affecting wear  
d) Tribological aspects in piston assembly

**P.T.O.**

## SECTION - II

- Q5)** a) Following data is given for a hydrostatic thrust bearing : **[10]**
- Shaft diameter = 500 mm  
Recess diameter = 300 mm  
Thrust Load = 500 kN  
Shaft Speed = 720 RPM  
Viscosity of the oil = 30 cP  
Film thickness = 0.15 mm  
Sp.gravity of the oil = 0.86  
Specific heat of the oil = 1.75 kJ/kg-K
- Calculate :
- i) Supply pressure,
  - ii) Flow requirement in lpm
  - iii) Power loss in pumping
  - iv) Frictional power loss
  - v) Temperature rise.
- b) Derive an expression for semi-width contact for elasto-hydrodynamic lubrication of cylinders. **[8]**
- 
- Q6)** a) What is preventive maintenance? Differentiate between regular maintenance and preventive maintenance. **[8]**
- b) Explain signature analysis condition monitoring technique in case of engine bearings. **[8]**
- 
- Q7)** a) Explain maintenance of batteries and factors affecting on battery life. **[8]**
- b) Explain maintenance of drive line systems in detail. **[8]**
- 
- Q8)** Write short notes on : **[16]**
- a) Hydroplaning
  - b) Noise and wear maintenance
  - c) Cooling system maintenance
  - d) Road Tyre contacts





Total No. of Questions : 8]

SEAT No. :

**P4019**

[Total No. of Pages : 2

**[4860]-136**

**M.E. (Mechanical) (Automotive Engineering)**  
**AUTOMOTIVE SAFETY AND REGULATIONS**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from Section I and three questions from Section II.*
- 2) *Answers to the two Sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the terms “Active safety system and Passive safety systems”. Give suitable example of each. **[8]**  
b) What do you understand by safety assessment of vehicles? What are various provisions of it? Explain. **[8]**
- Q2)** a) What is vehicle crashworthiness? What are various characteristics of it. **[8]**  
b) Describe various tests involved in crash testing of vehicles. What parameters are studied in crash test? Explain in details. **[8]**
- Q3)** a) Discuss importance’s of ergonomics in Automotive safety. **[8]**  
b) What are the design requirements of automotive seat? Explain. **[8]**
- Q4)** Write short note on following (Any Three) : **[18]**  
a) Head restraint.  
b) Governing material properties for vehicle crashworthiness.  
c) Hybrid III dummy.  
d) Seat belt and its anchoring.

**P.T.O.**

## SECTION - II

- Q5)** a) Describe the role of side door intrusion beam in providing safety in case of side impacts. [8]  
b) What are various types of rear view mirrors? Explain in brief principal involved there in. [8]
- Q6)** a) What testing procedure is followed for lamps and reflectors in automotive testing laboratory? Explain beam pattern and specification followed for head lamp testing as per CMVR rules. [8]  
b) Explain asymmetrical beam used in head lamp. What is merits and demerits of plastic lens head lamps? [8]
- Q7)** a) As per CMVR describe the following procedure - [8]  
i) Registration of motor vehicle.  
ii) Insurance of motor vehicle against third part risk.  
b) Describe various passive safety regulations adopted in India as per IS/AIS. [8]
- Q8)** Write short note on the following (Any Three) : [18]  
a) Luminance meter and its principle.  
b) Adaptive front lighting system.  
c) Testing track for vehicle.  
d) Role of ergonomics in vehicle safety.



Total No. of Questions : 8]

SEAT No. :

P4020

[Total No. of Pages : 2

[4860]-138

**M.E. (Mechanical) (Automotive Engineering)**

**AUTOMOTIVE FUELS AND EMISSIONS**

**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Attempt ANY THREE questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What is enthalpy of combustion? How does it differ from the enthalpy of reaction? [8]
- b) State the first law for reacting systems. What is adiabatic flame temperature. [8]
- Q2)** a) What are anti knock agents? Main difference between working of anti knock agent in SI and CI ENGINES? [8]
- b) Compare 'air swirl' in C.I. Engines with 'turbulence' in S.I. Engines. [8]
- Q3)** a) Write a detailed account on need, availability properties, merits and demerits of various alternative fuels. [8]
- b) Explain the products of hydrogen gas and its performance and safety aspect. [8]
- Q4)** Write short notes on : [18]
- a) Octane and Cetane rating
  - b) Fugacity and Activity
  - c) Chemical equilibrium

**P.T.O.**

## SECTION - II

- Q5)** a) How the transient operation of the Turbo charged diesel engines will effect the emission formation? Explain it in detail. [10]  
b) What is a driving cycle? Discuss its significance with regard to emissions. [6]
- Q6)** a) What is meant by a fuel cell? How it is related to automotive pollution?[8]  
b) What are the fuel modifications can reduce the emission from S.I. engines. [8]
- Q7)** a) Which is the statutory agency monitoring and assessing the vehicular population in the cities and how the vehicular emissions are monitored and regulated by them? Explain it in detail? [10]  
b) What is meant by regulated pollution and un regulated pollution? Discuss briefly? [6]
- Q8)** Write notes on : [18]  
a) BS III and BS IV norms  
b) Charcoal Canister Control for Evaporative Emission Control  
c) Emission inventory



Total No. of Questions : 10]

SEAT No. :

**P4492**

**[4860] - 139**

[Total No. of Pages : 2

**M.E. (Mechanical Engineering - Automotive Engineering)**

**AUTOTRONICS**

**(2008 Course) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from each section.*
- 2) *Answer to the each section should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume Suitable data, if required.*

**SECTION - I**

- Q1)** a) Write a note on components of engine management system. [6]  
b) Explain working on electronic management system. [10]
- Q2)** a) Write a note on oxygen and CO<sub>2</sub> sensor. [10]  
b) Explain working of Detonation sensor. [6]
- Q3)** a) What is meant by multipoint fuel injection system and explain its working and advantages. [10]  
b) Explain Feedback Carburettor System. [6]
- Q4)** a) How electronic spark time is achieved in automotive explain in detail. [8]  
b) Write a note on exhaust emission control. [10]
- Q5)** a) Explain throttle position control. [4]  
b) How Integrated engine control system is achieved? [6]  
c) What is meant by warm up control and how it is achieved in automotives. [6]

**P.T.O.**

## SECTION - II

- Q6)** a) List down the safety systems used in automotive and explain belt tensioner in detail. [8]  
b) Explain Central locking system and its working. [8]
- Q7)** a) Explain working of ABS Control System. [8]  
b) What is meant by Cruise Control and its working. [8]
- Q8)** a) Explain onboard diagnostic techniques. [8]  
b) Explain Security and Warning systems in on-board diagnostics. [8]
- Q9)** Write a note on following (Attempt any two) [18]  
a) Electromagnetic Compatibility.  
b) Dashboard Instruments.  
c) Automotive instrumentation and telematics.
- Q10)** a) Lighting System used in Automotive write a note on it. [8]  
b) Explain Starter motor and Regulation for charging in automotive. [8]



Total No. of Questions : 8]

SEAT No. :

P4449

[4860] - 14

[Total No. of Pages : 4

**M.E. (Civil) (Construction and Management)**  
**OPERATION RESEARCH**  
**(2008 Course) (501110) (Semester - II)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any three questions from Section - I and any three questions from Section - II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat and clean diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** For each of the following function show whether it is convex, concave or neither. **[8]**

i)  $f(x) = 15 - x^2$

ii)  $f(x) = x^4 + 6x^2 + 10x$

iii)  $f(x) = x^3 + x^4$

iv)  $f(x) = x_1^2 + x_2^2 - 2x_1x_2$

**b)** Solve the following by Simplex Method **[8]**

Maximize,  $Z = 2x_1 + 3x_2$

Subject to,  $x_1 \leq 6$

$$x_1 + 2x_2 \leq 10$$

$$x_1 + x_2 \geq 2$$

$$x_1, x_2 \geq 0.$$

**Q2) a)** Solve the following problem by Two-Phase method: **[8]**

Maximize,  $Z = 5x_1 + x_2$

Subject to constraint,  $2x_1 + x_2 \leq 1$

$$x_1 + 4x_2 \geq 6$$

$$x_1, x_2 \geq 0.$$

**P.T.O.**

b) Solve by Big M Method: [8]

$$\text{Maximize } Z = 3x_1 - x_2$$

$$\text{Subject to, } 2x_1 + x_2 \leq 2$$

$$x_1 + 3x_2 \geq 3$$

$$x_2 \leq 4$$

$$x_1, x_2 \geq 0.$$

Q3) a) Write a short note on: [7]

i) Assignment model.

ii) Transportation model.

iii) Advantages of each in civil engineering.

b) A company manufacturing concrete pipes has plants at Mumbai, Kolkata and Kanpur. Supplies are made to three shops situated at Ranchi, Delhi and Lucknow. Each manufacturing plant has capacity of 200 units per month. The monthly requirements of shops are 150, 300, and 150 Nos. respectively. Due to difference in raw material cost and transportation cost the profit per unit is different for each shop as given below: [9]

	Ranchi	Delhi	Lucknow
Mumbai	290	280	300
Kolkata	250	270	230
Kanpur	350	370	380

Q4) a) The table gives you the costs of employing different types of earth moving equipment in different types of jobs. Find the assignment of the equipment of various jobs such that the overall cost is minimum. [9]

Equipment	Jobs				
	1	2	3	4	5
A	14	12	15	9	11
B	17	9	13	15	4
C	9	11	16	14	13
D	12	8	14	4	15
E	5	7	9	10	2



- b) Explain the terms: [9]
- i) Stationary point, point of inflection of the function.
  - ii) Relative maxima, relative minima.
  - iii) Global maxima, global minima.
  - iv) Concave & Convex functions.

**SECTION - II**

- Q5) a)** Solve by using Lagrange's multiplier method. [8]

$$\text{Minimize } Z = 3x_1^2 + 2x_2 + 3x_3^2 + 10x_1 + 9x_2 + 16x_3 - 50$$

$$\text{Subject to, } 2x_1 + x_2 + 2x_3 = 40$$

$$x_1, x_2, x_3 \geq 0.$$

- b) Find maximum of function  $f(x)$  given as,  $f(x) = x(5 - x)$  in the interval of  $(0, 1)$  to an accuracy of 10%. By Dichotomous search techniques. [8]

- Q6) a)** What is Dynamic programming? And state and explain Bellman's principle of optimality. [8]

- b) Write a short note on Simulation theory. [6]

- c) What is benefit - cost analysis? And explain its use in decision making in civil engineering projects. [4]

- Q7) a)** A company whose discount rate is 5% per annum is investing in one of the 3 projects whose financial and other particular are given below. Rank projects by B/C and NPV criteria. [8]

	Project A	Project B	Project C
Initial cost (Rs. million)	62	54	74
Annual Benefits (Rs. million)	10	10	20
Project Life (Years)	10	8	5

- b) Explain Games theory and its applications to construction management. [8]

- Q8) a)** Suppose the inter-arrival time and the service time of a waiting line problem have the following frequencies. Simulate the waiting line system and calculate the average waiting time of an arrival. **[8]**

Inter-arrival time	Frequency	Service time (hrs.)	Frequency
2	8	3	5
3	12	4	12
4	28	5	48
5	22	6	30
6	15	7	5
7	9	--	--
8	6	--	--

- b)** A manufacturing firm has to carry out processing of 5 jobs in 3 different compartments A, B and C in that order. The time required in each job in each department is as: **[8]**

Job	Dept. A	Dept. B	Dept. C
1	15	8	20
2	12	10	21
3	13	14	16
4	19	11	14
5	16	13	19

Find the sequence in which the jobs are to be processed when no-by-passing is allowed so that the total elapsed time is minimum. Also determine the idle time of the department if any.



Total No. of Questions : 10]

SEAT No. :

P4021

[Total No. of Pages : 2

[4860]-140

**M.E. (Mechanical) (Automotive Engineering)**  
**FUNDAMENTALS OF VEHICLE DYNAMICS**  
**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Attempt any three questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What do you understand by the term 'RIDE PERCEPTION' and what are the ride excitation sources? [8]  
b) Explain the Generalized block diagram of Driver-Vehicle relationship. [8]
- Q2)** What are test carried out for determining handling characteristics of vehicle? Explain each test in detail. [16]
- Q3)** a) The sprung parts of a passenger car weigh 9.5 kN and the unsprung parts weigh 850 N. The combined stiffness of the suspension springs is 41.5 kN/m and that of the tires is 551.3 kN/m. Determine the two natural frequencies of bounce motion of the sprung and unsprung mass. Derive the formula used. [8]  
b) Derive an expression for the steer angle  $\delta_f$  required to negotiate a given turn with usual notations. [8]
- Q4)** A vehicle is treated as two degree freedom system in bounce and pitch mode. The mass of the vehicle is 1350 kg and its radius of gyration is 1.3 m. The stiffness of the front suspension is 135 kN/m and that of rear suspension is 155 kN/m. Center of gravity of the vehicle is 1.4m from front, 1.2 m from rear wheel and 0.6 m above ground. Find the natural frequencies and mode shapes. Derive the formula used. [16]

**P.T.O.**

- Q5)** Write short notes : **[18]**
- a) Sinusoidal transmissibility function.
  - b) Kinematic behavior of vehicles with rigid wheels and with compliant tyres.
  - c) Natural frequency and damping in yaw

**SECTION - II**

- Q6)** a) Explain application of theory of steering of articulated and half-track vehicles. **[8]**  
b) Describe the Extension of two degree of freedom theory to include effects of traction and braking. **[8]**
- Q7)** A passenger car weighs 2.5 kN and has a wheelbase of 3.4 m. The center of gravity is 0.83 m behind the front axle and 0.54 m above ground level. The braking effort distribution on the front axle is 68%. The coefficient of rolling resistance is 0.04. Determine which set of the tires will lock first on two road surfaces : one with a coefficient of road adhesion  $\mu = 0.7$ , and the other with  $\mu = 0.3$ . **[16]**
- Q8)** a) Explain Wheel hop, wheel wobble, wheel shimmy. **[8]**  
b) Development of equations of motion of sprung mass. **[8]**
- Q9)** Explain with the help of labeled sketch mechanism and handling of tracked vehicle. **[16]**
- Q10)** Write short notes : **[18]**
- a) Self-aligning torque.
  - b) Analysis of sprocket torques and speeds.
  - c) choice of damper characteristics.



Total No. of Questions : 10]

SEAT No. :

**P4249**

**[4860]-141**

[Total No. of Pages : 3

**M.E. (Mechanical Engg. - Automotive)  
a-NOISE, VIBRATIONS & HARSHNESS  
(2008 Course) (502309) (Elective-III) (Semester-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two Sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figure to the right indicates full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) Explain the different techniques used to noise control. **[8]**
- b) Explain propagation of sound, reflection of sound, absorption of sound and refraction of sound? **[8]**
- Q2)** a) Describe the different types of accelerometer mounting for vibration measurements with their advantages and disadvantages. **[8]**
- b) An Octave band analysis was done on an automatic wood lathe in operation. It was found that the octave band sound pressure levels were 93 dB at 250 Hz, 94 dB at 500 Hz, 96 dB at 1000 Hz, 96 dB at 2000 Hz, 94 dB at 4000 Hz and 93 dB at 8000 Hz. What is the total Mean Square pressure? **[8]**
- Q3)** The tone from a tuning fork is 440 Hz and has a measured sound pressure level of 54 dB at a radial distance of 10 m. Assuming the sound waves are radiating uniformly in all directions (spherically), what is the power level of the source? What is the sound pressure level at 20 m? **[16]**

**P.T.O.**

- Q4)** a) Explain Pass by Noise measurement of Vehicle. [8]  
b) Explain effect of noise on human beings and what are noise specifications for generator sets, fire crackers and household articles. [8]

**Q5)** Write short notes on Any Three of the following: [18]

- a) Importance of NVH.  
b) Sound Intensity Level.  
c) Interior noise of vehicles.  
d) Digital Signal Processing.

## **SECTION-II**

- Q6)** a) Explain in detail different sound fields and state its significance. [8]  
b) What do you mean by Sound intensity and Sound power mapping. [8]

- Q7)** a) Explain Structure borne noise and Air borne noise in car. [8]  
b) Two machines are working in noisy environments. The background noise when the machines are inoperative is 55 dB. If the two machines having individual sound pressure levels of 85 and 89 dB are switched on simultaneously, determine the combined sound pressure level of the machines along with the background noise. [8]

- Q8)** a) Explain the experimental modal analysis technique with help of basic component of modal test setup. [8]  
b) What are the different types of sound Absorbers are used? [8]

- Q9)** a) Explain construction and working principle of an Electrodynamic shaker. [8]
- b) Explain the working of Helmholtz resonator type Muffler. [8]

**Q10)** Write short notes on Any Three of the following: [18]

- a) Anechoic chamber and Reverberation chamber.
- b) Broad band noise, Pink noise, White noise.
- c) Structure borne noise and Air borne noise in car.
- d) Acoustic Holography.



Total No. of Questions : 8]

SEAT No. :

P4022

[Total No. of Pages : 2

[4860]-142

M.E. (Mechanical) (Automotive)

AUTOMOTIVE MATERIALS (Elective - III)

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt ANY THREE questions from each section.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

**SECTION - I**

- Q1)** a) Write compositions, properties and applications of following copper alloys (any two) [8]
- i) Cartridge Brass
  - ii) Tin Bronze
  - iii) Berilium Bronze
- b) Write detailed note on classifications of steels. [4]
- c) State effects of alloying elements on properties of steels. [4]
- i) Mn ii) Cr
  - iii) Nb iv) V
- Q2)** a) Explain importance of heat treatment in design of mechanical components. [4]
- b) Explain importance of surface hardening heat treatments and explain one of such heat treatment in detail. [8]
- c) Explain significance of 'hardenability' and how it is determined? [4]
- Q3)** a) List properties and auto applications of PP, PS and PMMA polymers. [6]
- b) Enlist CMCs and MMCs use in automotive applications and explain one of them in detail. [6]
- c) What are nanocomposites? State their applications in automotive applications. [4]

P.T.O.



- Q4)** Write short notes on following manufacturing processes (any three) : **[18]**
- a) Extrusion
  - b) Forging
  - c) Welding
  - d) Powder Metallurgy

## **SECTION - II**

- Q5)** Write short notes on following techniques (any four) : **[16]**
- a) Compression moulding
  - b) Reaction injection moulding
  - c) Pulforming
  - d) Filament winding
  - e) Blow moulding
- Q6)**
- a) What is significance of protective coating in automotive applications. Explain PVD method to protect surface of component. **[6]**
  - b) Write short note on sound insulating materials used in automotive applications. **[4]**
  - c) State important physic-chemical properties of following : **[6]**
    - i) Engine oil
    - ii) Brake fluids
    - iii) Antifreeze engine coolants
- Q7)**
- a) Explain importance of endurance limit of component and write short note on corrosion-fatigue. **[6]**
  - b) Explain types of failures and write short note on 'Fracture mechanisms'. **[6]**
  - c) Explain need of testing and validation of components. **[4]**
- Q8)** Explain requirements of mechanical properties with justification and enlist candidate materials for following applications (any three) : **[18]**
- a) Shock absorber
  - b) Propeller shaft
  - c) Gudgeon pin
  - d) Brake liner



Total No. of Questions : 8]

SEAT No. :

**P4493**

**[4860] - 143**

[Total No. of Pages : 2

**M.E. (Mechanical - Automotive Engineering)**

**c - VEHICLE AERODYNAMICS**

**(2008 Course) (Semester - II) (502309) (Elective - III)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any THREE questions from Section I and any THREE questions from Section - II.*
- 2) *Answers to the Two Sections should be written in separate answer books.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Use of scientific calculator is allowed.*
- 5) *Assume Suitable data where ever necessary.*
- 6) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) Explain the external and internal flow problems related to vehicle. [8]  
b) Describe a pressure and friction drag of a bluff body. [8]
- Q2)** a) Explain in details effects of rear spoiler of a car. [4]  
b) With neat sketches explain the air flow around following components of a car and its effect on design of these components. [12]  
i) External mirror  
ii) Windshield wipers
- Q3)** a) What are the objectives of analyzing drag? Explain method of observation of drag fractions and their origins. [10]  
b) Explain with neat sketches forces and moments on the vehicle. [6]
- Q4)** Write notes on : (Any three) [18]  
a) Rear Spoiler and its effect.  
b) Shape optimization of car bodies.  
c) Dirt accumulation on vehicle and its remedy.  
d) Aerodynamic stability in case of vehicle.

**P.T.O.**

## SECTION - II

- Q5)** a) Describe advantages and disadvantages of tests with reduced scale model. [8]  
b) Explain the details of components used in wind tunnel section. [8]
- Q6)** a) ‘Wind tunnels and CFD are both simulators - wind tunnel analog, CFD digital’ Elaborate the statements with current scenario. [8]  
b) Explain flow visualization techniques on vehicle body with the sketch of flow pattern. [8]
- Q7)** Explain with neat sketches the Panel and Euler CFD methods. How these methods are used in vehicle aerodynamics. [16]
- Q8)** Write short note on [18]  
a) Climate Tunnels.  
b) Evaluation and Perspective of CFD method.  
c) Wind noise measurement on the road.



Total No. of Questions : 8]

SEAT No. :

P4023

[Total No. of Pages : 2

[4860]-144

**M.E. (Mechanical-Automotive Engineering)**

**COMPUTATIONAL FLUID DYNAMICS**

**(2008 Pattern) (Elective - IV (a))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary and mention it clearly.*

**SECTION - I**

**Q1)** a) Explain physical significance of substantial derivative and divergence of velocity. **[10]**

b) Classify PDEs with one example of each. **[6]**

**Q2)** a) Consider an infinitesimally small control volume fixed in space of size  $dx$ ,  $dy$  and  $dz$ , derive the continuity equation in differential conservative form. **[12]**

b) Discuss the various types of boundary conditions with examples of each. **[6]**

**Q3)** a) Find the forward difference approximation of  $\left(\frac{\partial^3 f}{\partial x^3}\right)$  **[10]**

of the order of  $(\Delta x)$  for evenly grid spaced points using

i) Using Taylor series expansion

ii) Forward difference formula

b) Write short note on : Types of grids and grid generation. **[6]**

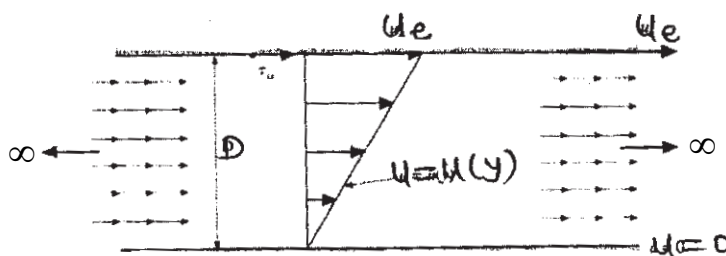
**P.T.O.**

**Q4)** Present the algorithm for Alternating Direction Implicit (ADI) scheme for solving two dimensional transient heat conduction equation. What is the main advantage of this scheme? [16]

**SECTION - II**

**Q5)** For supersonic flow over flat plate [16]  
 a) Write the full governing equations  
 b) Present the algorithm for updating  $u$ , the x-component velocity.

**Q6)** Explain step by step the pressure correction technique for solution of incompressible flow between two parallel plates (Couttee flow) in relative motion as shown in fig. The upper plate velocity  $u_e$  and for stationary plate is  $u = 0$ . Two plates are separated by distance  $D$ . [16]



**Q7)** a) Outline the MAC algorithm for fluid flow solution. [6]  
 b) Take a suitable 2D Cartesian grid, show how surface and volume integral can be approximated. [10]

**Q8)** Write short note on : [18]  
 a) Navier Stokes equations  
 b) Thomas algorithm  
 c) CFD simulation technique



Total No. of Questions : 8]

SEAT No. :

**P4494**

**[4860] - 145**

[Total No. of Pages : 2

**M.E. (Mechanical - Automotive Engineering)**

**b - AUTOMOTIVE CHASSIS DESIGN**

**(2008 Course) (Semester - II) (Elective - IV) (502310)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from Section I and three questions from Section - II.*
- 2) *Answers to the Two Section should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rules and electronic pocket calculator & allowed.*
- 6) *Assume Suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What is the purpose of independent suspension system? How is it achieved in front and rear axle? **[8]**
- b) A motor car is fitted with a mono shock suspension system i.e. only one shock absorber is mounted in front of rear wheel. The laden weight of the bike is 240 Kg. selecting a suitable material and assuming appropriate deflection during rough ride, design the spring specifying no. of active / inactive coils, mean coil diameter, wire diameter, solid length, free length and types of ends. Draw a sketch showing its mounting. **[8]**
- Q2)** a) Explain the function and working of steering gear box mechanism with neat sketch. Name its components. **[8]**
- b) Describe briefly the following three basic suspension movements of an Automobile; Bouncing, Rolling & Pitching. **[8]**
- Q3)** a) Explain With the help of neat sketches steering characteristics i.e. under steer and over steer. **[8]**
- b) Explain with the help of neat sketch servo-power assisted braking systems. **[8]**

**P.T.O.**

- Q4)** Write short note on the following : (Any three) **[18]**
- a) Active suspension.
  - b) Variable rate spring.
  - c) Wheel alignment.
  - d) Hydraulic braking system.

**SECTION - II**

- Q5)** a) Explain with the help of neat sketch Direct-acting vacuum servos. **[8]**  
b) Write short note on ABS giving its advantages over normal braking system. **[8]**
- Q6)** a) What are the advantages and disadvantages of Tubeless Tire with respect to conventional tires? **[8]**  
b) Explain tyre construction with help of neat sketch. **[8]**
- Q7)** a) Explain the spring stresses in rigid six wheelers. **[8]**  
b) Explain with the help of neat sketch scammell design. **[8]**
- Q8)** Write short note on the following (Any three) **[18]**
- a) Apportioning Valve.
  - b) Tread design.
  - c) Specifications of tyres with respect to sizes, dimensions, ply ratings & markings.
  - d) Types of tracks used for vehicle evaluation.



Total No. of Questions : 12]

SEAT No. :

**P4639**

[4860] - 147

[Total No. of Pages : 2

**M.E. (Electrical Control System)**  
**ADVANCE MATHEMATICAL TECHNIQUES FOR**  
**CONTROL SYSTEMS**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer Qu 1 or 2, Qu 3 or 4, Qu 5 or 6, Qu 7 or 8, Qu 9 or 10, Qu 11 or 12.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

**Q1)** Use the Lagrange multiplier approach to minimize the function

$$F(x) = 4x_1^2 + 5x_2^2 \text{ subjected to } g(x) = 2x_1 + 3x_2 - 6 = 0 \quad [16]$$

**Q2)** a) Explain what do you understand by Lagrange Function. [8]

b) Explain what do you understand by relative and global maximum. [8]

**Q3)** Explain what do you understand by Multivariable Optimization with no constraint. Write necessary and sufficient condition. [16]

**Q4)** Find condition for minimization of the following condition by classical method

$$F(x) = 0.5k_2x_1^2 + 0.5k_3(x_2 - x_1)^2 + 0.5k_1x_2^2 - Px_2 \quad [16]$$

**Q5)** Maximize the function and also find the maximum value of the function.

$$F(X) = 20X_1 + 26X_2 + 4X_1X_2 - 4X_1^2 - 3X_2^2 \quad [18]$$

**Q6)** a) Explain what do you understand by dual simplex method. [9]

b) Write and explain the conjugate gradient method of obtaining the extremum. [9]

**P.T.O.**



## SECTION - II

**Q7)** Find the maximum of the function

$$f(x) = x/2 \text{ for } x \leq 2$$

$$= -x + 3 \text{ for } x > 2$$

by using the unrestricted search method. Initial guess point  $x_1 = -1.0$  and  $S = 0.4$  **[16]**

**Q8)** Find the maximum of  $f = X(1.5 - X)$  in the interval 0–1 within 10% of exact value by Dichotomous search method. **[16]**

**Q9)** Use simplex method to solve **[16]**

$$\text{Minimize } F = X_1 - 3X_2 + 2X_3$$

$$\text{Subject to } 3X_1 - X_2 + 2X_3 < 7$$

$$-2X_1 + 4X_2 < 12$$

$$-4X_1 + 3X_2 + 8X_3 < 10$$

$$X_1, X_2, X_3 > 0$$

**Q10)** Explain the multistage Decision process in dynamic programming. **[16]**

**Q11)** Explain the concept of suboptimization and principle of optimality used in multistage decision problem. **[18]**

**Q12) a)** Explain the Gomory's cutting plane method. **[9]**

b) Explain the integer nonlinear programming. **[9]**



Total No. of Questions : 6]

SEAT No. :

**P4643**

[Total No. of Pages : 2

**[4860] - 148**

**M.E. (Electrical)**

**PROCESS CONTROL MANAGEMENT**

**(2008 Pattern) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer to the two sections should be written in separate answer books.*
- 2) *Figures to the right side indicates full marks.*
- 3) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Solve any two.

**[18]**

- a) Write short note on Leadership in process control management.
- b) Explain in detail the classification of Motivation.
- c) What are formal & informal groups? Describe each with example.
- d) What do you mean by Conflict Management? Describe it.

**Q2)** Solve any two.

**[16]**

- a) Explain with suitable example control strategies for designing of control system.
- b) What are the essential needs for a control system to be satisfied?
- c) Draw and explain the block diagram of process control system.

**Q3)** Solve any two.

**[16]**

- a) Compare P, PI and PID controller action in detail.
- b) What is importance of Mathematical modeling? Develop a mathematical model of Heat Exchanger with proper diagram.
- c) Explain Zigler-Nichols closed loop method for tuning of controller in detail.

***P.T.O.***

## SECTION - II

- Q4)** a) Explain advantages and limitations of Digital Control System. Also explain its block diagram. [9]
- b) Write short note on Discrete PID control algorithm. [9]
- Q5)** a) What is one way decoupling of two control loops? Why it could be acceptable? [8]
- b) Explain how you can use Relative Gain Array (RGA) to select loops with minimum interaction. [8]
- Q6)** a) Explain the effect of interaction on the stability of multi loop control systems. [8]
- b) Describe interaction of control loops in a stirred tank heater for liquid level and temperature control with suitable diagram. [8]



Total No. of Questions : 12]

SEAT No. :

P4024

[Total No. of Pages : 3

[4860]-149

M.E. (Electrical) (Control Systems)

NON LINEAR CONTROL SYSTEMS (Semester - I)

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate books.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

**SECTION - I**

- Q1)** a) Compare with suitable example Linear and nonlinear system. [8]  
b) What are various non linearity present in the system. Explain each with suitable example. [9]

OR

- Q2)** a) Explain following terms : [9]  
i) Jump Resonance  
ii) Limit Cycle  
iii) Amplitude frequency dependance  
b) Explain following terms : [8]  
i) Phase plane  
ii) Phase plane trajectory  
iii) Isoclines  
iv) Phase portrait

- Q3)** Describe Isocline and Delta method to plot phase plane trajectory. [16]

OR

- Q4)** Draw phase plane trajectory of second order equation  $\ddot{x} + 2\dot{x} + 3x = 0$  with initial condition  $\dot{x} = 2.0, x = 0$  comment on stability. [16]

**P.T.O.**

- Q5)** Derive Describing function of **[17]**  
 i) On-Off relay  
 ii) Saturation

OR

- Q6)** Determine the frequency and amplitude of limit cycle if exist of a system for a unity feedback, an ideal relay with out put equal to  $\pm 1$  is connected in cascade with the forward path transfer function  $G(S) = \frac{1}{S(S+2)}$ . **[17]**

### SECTION - II

- Q7)** a) Express the scalar function given below in Quadratic form and test it for definiteness

$$V(x) = x_1^2 + x_2^2 - 2x_3^2 + x_1x_2 + 2x_2x_3 - 5x_3x_1 \quad [8]$$

- b) Explain Liapunov's direct method for stability analysis. **[8]**

OR

- Q8)** a) Explain : **[8]**

- i) Positive and negative definiteness  
 ii) positive and negative semi definiteness

- b) Select Liapunov function and determine stability for an autonomous system given below : **[8]**

$$\dot{x} = \begin{bmatrix} 1 & 0 \\ -2 & -5 \end{bmatrix} x$$

- Q9)** a) Explain Liapunov's Indirect method for stability analysis. **[8]**

- b) Apply Liapunov direct method to determine stability of the given system. **[8]**

$$\dot{x}_1 = -2x_1 + x_2$$

$$\dot{x}_2 = x_1^2$$

OR

- Q10)** a) Explain Krasovskii method for determination of Liapunov function. **[8]**

- b) Derive expression  $A^T P + P A = -Q$  for linear time invariant system  $\dot{x} = A x$  where P & Q are real symmetric and positive definite matrices. **[8]**

**Q11)** Write short notes on any Two : **[18]**

- a) Notion of Sliding Mode Control
- b) Input - Output Linearization
- c) Input State Linearization

OR

**Q12)** A nonlinear system is represented by **[18]**

$$\dot{x}_1 = x_1 - x_1^2 - x_1x_2$$

$$\dot{x}_2 = x_2 - 2x_2^2 - 3x_1x_2$$

Obtain all the equilibrium points of the system.



Total No. of Questions : 8]

SEAT No. :

**P4450**

**[4860] - 15**

[Total No. of Pages : 2

**M.E. (Civil - Construction & Management)**

**a - ADVANCED CONSTRUCTION TECHNOLOGY**

**(2008 Pattern) (Elective - III) (Semester - II) (501111)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data if necessary.*

**SECTION - I**

**Q1)** Electrical Transmission Towers are to be erected on a hill. Discuss the project w.r.t. following points. **[18]**

- a) Construction sequence (from concept to commissioning).
- b) Project Management on site.
- c) Advance techniques used on site.
- d) Safety measures on site.
- e) Risks involved.

**Q2)** Discuss the construction sequence of a suspension bridge for substructure as well as super structure. Include following points. **[16]**

**Q3) a)** Discuss advanced methods used to control seepage through earthen dam. **[8]**

b) What are the types of off shore constructions w.r.t. **[8]**

i) Method of construction.

ii) Depth.

iii) Applications.

**Q4)** Discuss the sequences followed in the strengthening of bridge piers. **[16]**

**P.T.O.**

## SECTION - II

- Q5)** Describe the HOT RECYCLER Plant used for bituminous roads. What are the construction activities involved in it? Also, discuss its advantages and limitations. **[18]**
- Q6)** Explain the method of calculating production for following equipments. **[16]**
- a) Excavator.
  - b) Compacting equipments - roller.
  - c) Aggregate crushing plant.
  - d) RMC plant.
- Q7)** a) Discuss the equipments and techniques used for construction of tunnels in Konkan Railway. **[8]**
- b) Write a note on machine foundation. **[8]**
- Q8)** Give the types of Fast Track Construction methods that are commonly used today. Discuss any one of it w.r.t. following points. **[16]**
- a) Method of construction.
  - b) Advantages over the conventional methods.





Total No. of Questions : 12]

SEAT No. :

P4025

[Total No. of Pages : 2

[4860]-150

**M.E. (Control System) (Semester - I)**

**AUTOMATION AND ROBOTICS**

**(2008 Pattern) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers 3 questions from Section I and 3 questions from Section II.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** a) Explain in detail following terms - degree of freedom, yaw, pitch and roll. [10]

b) What is work envelope of a Robot? Explain with neat diagram. [8]

OR

**Q2)** a) Compare NC and CNC machines. [9]

b) Give Definition of Robotic/s given by various organization including ISO. [9]

**Q3)** a) Give Robot Classification in detail. [8]

b) Write various Grippers used in design of Robot. [8]

OR

**Q4)** a) Explain various types of end effectors. Draw at least one sketch. [8]

b) Explain Robot classification according to form of motion. [8]

**P.T.O.**

- Q5)** a) What are the various applications of robot? Explain any one of them in detail. [8]  
b) What are the various actuators required in robot applications. And what are their selection criteria. [8]

OR

- Q6)** a) Explain online and offline robot programming. [8]  
b) Explain Teach pendent in detail with neat sketch. [8]

### SECTION - II

- Q7)** a) The coordinates of the point 'P' on the body are given by  $\{2, 2, 4\}^T$  the point is rotated about z axis by  $30^\circ$  and then about by  $60^\circ$  and then by  $90^\circ$ . Find the final coordinates of the point 'P' w.r.t. the fixed frame. [10]  
b) Explain homogeneous transformation matrix and it's use in transformational transformation. [8]

OR

- Q8)** a) Form Newton Euler Equation using KE and PE. [9]  
b) Explain single prismatic joint working against gravity and single revolute joint using Lagrangian technique. [9]

- Q9)** a) Give one example of forward solution for PUMA robot. [8]  
b) Explain Geometric approach with co-ordinate transformation. [8]

OR

- Q10)** a) Explain Denavit Hartenberg in detail. [8]  
b) Write Rules for establishing link co-ordinate frames. [8]

- Q11)** a) Explain PD control system used in robot manipulator. [8]  
b) Explain Joint Position Control used in robot system. [8]

OR

- Q12)** a) Explain Jacobian for prismatic joint control which is used in Cartesian type of robot. [8]  
b) Explain Resolved Motion Rate control used in robot system. [8]



Total No. of Questions : 12]

SEAT No. :

**P4495**

**[4860] - 153**

[Total No. of Pages : 3

**M.E. (Electrical) (Control System)**

**b - COMPUTERAIDED CONTROL SYSTEM DESIGN**

**(Elective - II) (2008 Course) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer three questions from section - I and three questions from section - II.*
- 2) *Answers to the sections - I & II should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume Suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Define and explain the concept of Relative stability. State and explain the measures of relative stability using polar plot and Bode Plots. [8]
- b) Derive the transfer function and draw the corresponding Bode diagrams of the Phase - Lag - Lead compensating network. [10]

OR

- Q2)** a) State and explain the conditions for compensation. [6]
- b) A linear time-invariant unity feedback control system has forward path transfer function [12]

$$G(S) = \frac{K}{s(1+0.2s)(1+0.1s)}$$

Design a suitable compensator to satisfy the following design specifications:

- i) Phase Margin  $\geq 50^\circ$
- ii) Velocity error constant  $k_v \geq 8 \text{ sec}^{-1}$

Draw the Bode diagrams for uncompensated and compensated system.

- Q3)** a) Outline the computer method for obtaining the polar plot of a typical linear control system with open-loop transfer function  $G(S) H(S)$ . Draw the flow chart and give its algorithm. [10]
- b) Explain clearly how to reshape this polar plot to obtain the optimum performance. [6]

OR

**P.T.O.**

**Q4) a)** Discuss the computer method for obtaining the transient response of a linear closed - loop control system having closed-loop transfer function  $\frac{C(S)}{R(S)}$ . Give its algorithm and draw the flow chart. [10]

b) Explain how to reshape this transient response plot of obtain optimum performance. [6]

**Q5) a)** State the merits and demerits of Describing function method for the design of nonlinear control system. [6]

b) Discuss with suitable example the describing function method for simulation of nonlinear control system containing 'dead-zone' nonlinearity. Give its algorithm. [10]

OR

**Q6) a)** Define a singular point in phase plane. Discuss the different singular points and explain how to predict the stability from phase plane trajectory? [6]

b) Outline the computer method for obtaining the phase plane trajectory for a nonlinear control system with 'Saturation' as nonlinearity. Give its algorithm or flow chart. [10]

### SECTION - II

**Q7) a)** Define S-plane stability. Outline the procedure for determining the stability of a control system represented in state space form. Give its algorithm. [8]

b) Explain the computer method for obtaining the time response of a control system represented in state space form

$$\dot{x}(t) = A x(t) + B u(t)$$

$$y(t) = C x(t)$$

with usual notations. Give its algorithm. [10]

OR

**Q8) a)** Explain the computer method of determining the controllability and observability of the control system. Give its algorithm and draw its flow chart. [6]

- b) A certain control system is represented in state space form: [12]

$$\dot{x}(t) = \begin{bmatrix} 3 & 0 & -5 \\ -2 & 1 & 5 \\ 0 & 0 & -2 \end{bmatrix} x(t) + \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ -1 & 0 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & -1 \end{bmatrix} x(t)$$

Investigate the controllability and observability of the system.

- Q9)** a) Explain the pole placement design using linear state variable feedback. Draw the appropriate block diagram. [6]  
 b) For the control system represented in state space form:

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 6 & 3 & -6 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$

Design the linear state variable feedback to place the poles at desired locations:  $S = -3$  and  $-2 \pm j3$  [10]

OR

- Q10)** a) What is an observer? State the merits and demerits of an observer system. [4]  
 b) Draw the block diagram showing the structure of full order observer system and explain the procedure for design of a full order observer. [12]

- Q11)** a) Explain with diagram the working of P, PI and PID controller. Why derivative controller is not used in isolated mode? [6]  
 b) Outline the procedure for design of PID controller using Ziegler - Nichol's method. Give its algorithm. [10]

OR

- Q12)** a) State the advantages of digital control system compared to continuous time control system. [6]  
 b) A discrete time control system is represented by the difference equation:

$$x(k+1) = Fx(k) + Gu(k)$$

Where 'k' is the sampling instant,  $x(k)$  is state vector,  $u(k)$  is control vector: F and G are constant matrices. Explain the computer method for finding the time response of the system. Give its algorithm. [10]



Total No. of Questions : 12]

SEAT No. :

P4026

[Total No. of Pages : 3

[4860] - 155

M.E. (Electrical) (Control System)

**MULTIVARIABLE AND OPTIMAL CONTROL SYSTEMS  
(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from section I and three questions from section II.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** The transfer function of a closed loop unity feedback control system is given by

$$T(s) = \begin{bmatrix} \frac{1}{s} & \frac{1}{s+1} \\ \frac{1}{s+1} & \frac{1}{s+2} \end{bmatrix}. \quad [18]$$

Find:

- i) State space model of the system
- ii) The differential operator form of the system.
- iii) The characteristic equation of the system.

OR

**Q2) a)** Explain the following presentation of MVCS with merits and demerits. [12]

- i) Transfer matrix form
  - ii) State space form
- b) Write short note on structure of a multivariable control with suitable example. [6]

**P.T.O.**

**Q3)** State and explain the concept, method of testing for following with suitable example. **[16]**

- a) Observability of MVCS
- b) Controllability of MVCS

OR

**Q4)** Investigate the observability and controllability of the system. **[16]**

$$\dot{x} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix} x(t) + \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 1 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix} x(t)$$

- Q5)** a) Explain procedure of pole allocation using Linear state variable feedback in multivariable control system. **[8]**
- b) Explain the structure of the state estimation problem using full order observer. **[8]**

OR

**Q6)** Discuss with suitable example the following design aspects of multivariable control system. **[16]**

- a) Model matching control.
- b) Decoupling and non-interactive control.

### **SECTION - II**

- Q7)** a) Discuss the procedure for obtaining the optimal control law for infinite time state regulator problem. **[8]**
- b) Obtain performance Index for optimal control of **[9]**
- i) Minimum fuel problem
  - ii) Minimum Time Problem
  - iii) Tracking problem

OR

**Q8)** A linear time - invariant control system is represented by the state equation

$$\dot{x} = \begin{bmatrix} 2 & 0 \\ 0 & -2 \end{bmatrix} x(t) + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u(t)$$

Determine the optimal control law  $u^*(t) = -Kx(t)$  so that following PI is minimized. K is the feedback gain Matrix

$$J = \frac{1}{2} \int_0^{\infty} [x^T(t)Qx(t) + u^T(t)Ru(t)] dt$$

$$\text{Assume } Q = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad R = 1 \quad [17]$$

**Q9)** Define Hamiltonian. Give the outline of procedure for solving the optimal control problem using Hamiltonian. [16]

OR

**Q10)** Give in detail outline of procedure for solving the optimal control problem using pontryagin's minimum principle. [16]

**Q11)** Explain in detail the Bang - bang control strategy. State it's advantages and limitations. [17]

OR

**Q12)** Explain optimization by dynamic programming based on [17]

- a) The imbedding principle
- b) The optimality principle

Also discuss relation between dyanamic programming and pontryagin's minimum principle.





Total No. of Questions : 8]

SEAT No. :

P4027

[Total No. of Pages : 3

[4860] - 156

M.E. (Electrical) (Control System)

**SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL  
(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Question no. 4 and 8 are compulsory.*
- 2) *Answer any two from questions 1 to 3.*
- 3) *Answer any two from questions 5 to 7.*
- 4) *Figures to the right indicate full marks.*

**SECTION - I**

**Q1)** a) With the help of a neat diagram explain the procedure for system identification. **[6]**

b) Compute the QR factorization of the matrix

$$A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}. \quad \text{[10]}$$

**Q2)** a) What do you understand by persistently exciting signal? What is the importance of a persistently exciting input signal in system identification? **[4]**

b) What is the order of the following signals **[12]**

- i) White noise
- ii) Step signal
- iii) Sum of Sinusoids
- iv) PRBS

**P.T.O.**

- Q3)** a) Discuss the various model structures used for system identification. [9]
- b) Consider that a set of data satisfy the model  $y(t) = \varphi^T(t)\theta + e(t)$ ; where  $e(t)$  is a white noise with variance given by  $\lambda^2$ . Derive the least square estimate  $\hat{\theta}$  and prove that the covariance matrix is given by  $\text{Cov}(\hat{\theta}) = \lambda^2 (\varphi^T \varphi)^{-1}$ . [7]

**Q4)** Write notes on any three. [18]

- Instrument Variable Method
- Bayesian Learning
- Recursive Estimation
- Choice of Input
- Pattern Recognition

### SECTION - II

- Q5)** a) What are the various adaptive schemes and how are they implemented? [8]
- b) Explain the pole placement design of an STR and derive the Diophantine equation. [8]
- Q6)** a) Prove the Matrix Inversion Lemma:  $[A + BCD]^{-1} = A^{-1} - A^{-1} B[C^{-1} + D A^{-1} B]^{-1} D A^{-1}$ . [4]
- b) An ideal relay with saturation levels  $\pm 1$  unit is connected in series with a system having a transfer function  $G(s) = \frac{10}{s(s+1)(s+10)}$ , in a unity feedback control system. Calculate the ultimate gain  $K_u$  and the ultimate period  $T_u$  using the Describing function method. [12]

- Q7)** a) Discuss in detail the “Ship Steering Dynamics”. [8]  
b) Explain the working of gain scheduling scheme. Give two applications of this scheme. [8]

- Q8)** a) Derive the MIT rule and explain the sign - sign algorithm. [6]  
b) Consider a position servo described by  $\frac{dv}{dt} = -av + bu$  and  $\frac{dy}{dt} = v$ ; where  $a$  and  $b$  are unknown.

Assume the control law  $u = \theta_1(u_c - y) - \theta_2v$  is used and that it is desired to control the system in such a way that the transfer function from

command signal to process output is given by  $G_m(s) = \frac{\omega^2}{s^2 + 2\xi\omega s + \omega^2}$ .

Determine an adaptive control law that adjusts the parameters so that the desired objective is obtained. [12]



Total No. of Questions : 12]

SEAT No. :

P4028

[Total No. of Pages : 2

[4860] - 157

**M.E. (Electrical) (Control System)**  
**ADVANCED DIGITAL CONTROL TECHNIQUES**  
**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data if necessary*

**SECTION - I**

- Q1)** a) Compare digital control with analogue control. [9]  
b) Explain the concept of 'Warping & Pre-Warping'. [9]

OR

- Q2)** a) Why digital re-design is necessary? Explain. [9]  
b) Explain closed form solution for digital system. [9]

- Q3)** a) Draw a block diagram for digital controller. State physical realizability considerations for digital controller. [8]  
b) Explain digital PID controller in detail. [8]

OR

- Q4)** a) Explain design of discrete data system using Z-transform method. [8]  
b) Enlist different steps required to design a digital phase lag compensator using root locus technique. [8]

**P.T.O.**

- Q5)** a) State and explain reduce order state observer. [8]  
 b) A discrete time regulator system is described as follows: [8]

$$X(k+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -4 & -2 & -1 \end{bmatrix} X(k) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k)$$

Design a state feedback controller which will place the close loop poles at  $-0.5 \pm j 0.5, 0$ . Draw the block diagram.

OR

- Q6)** a) Write a short note on state regulator design. [8]  
 b) Explain the concept of adaptive control with suitable example. [8]

**SECTION - II**

- Q7)** a) What is multi rate sampling? Explain in detail. [10]  
 b) Explain finite word length effect in digital filters. [8]

OR

- Q8)** a) What are different types of digital filters? State the out put equations for each type. [10]  
 b) What is fixed and floating point DSP? [8]

- Q9)** a) Explain instruction pipe line in DSP. [8]  
 b) State advantages of TMS320C54X DSP. [8]

OR

**Q10)** Draw and explain in detail architecture of TMS320C5X processor. [16]

- Q11)** a) Explain Arithmetic Logic Unit TMS320C5X processor. [8]  
 b) Explain direct addressing of TMS320C54X processor. [8]

OR

- Q12)** a) Explain sampling rate conversion in DSP. [8]  
 b) State and explain different addressing modes of TMS320C5X processor. [8]



Total No. of Questions : 8]

SEAT No. :

**P4451**

**[4860] - 16**

[Total No. of Pages : 2

**M.E. (Civil Construction and Management)  
b - INFRASTRUCTURE DEVELOPMENT  
(2008 Course) (Semester - II) (Elective - III)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Question No. 1 and 5 are compulsory. Out of the remaining attempt any two questions from Section I and two questions from Section II.*
- 3) *Answers to the two sections must be written in separate answer books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables, slide rule, Moiller charts, electronic pocket calculator and steam tables is allowed.*
- 7) *Assume suitable data wherever necessary.*

**SECTION - I**

- Q1)** a) What do you mean by the term FDI? Why does government allow FDI? In what sectors of Infrastructure Development has Govt. of India allowed FDI [8]
- b) List out various problems associated with successful completion of urban transport projects. Discuss the need and status of Slum Rehabilitation projects. [10]
- Q2)** a) List out the reasons for power shortage. What is the impact of reduced power generation on economic growth of countries like India and China. [8]
- b) According to you why there is difference in rate of development of urban and rural areas. How do we bridge this divide? [8]
- Q3)** a) What are the current problems faced by the aviation industry? Will these problems have impact on the rate of development of aviation infrastructure? [8]
- b) Do infrastructure projects get affected by economic slowdown? In either case explain with examples. [8]

**P.T.O.**

- Q4)** Write short notes on (any four): **[16]**
- a) Providing Urban Amenities in Rural Areas (PURA).
  - b) PMGSY.
  - c) NREGA.
  - d) Metro railway vs. sky bus project.
  - e) Facilities for pedestrians in urban transport systems.

**SECTION - II**

- Q5)** What are the incentives & opportunities given by the Govt. for PPP to local investors in development of infrastructure planning in **[18]**
- a) Construction of roads.
  - b) Aviation industry.
  - c) Development of ports.
  - d) Power projects.
- Q6)**
- a) What are the logistics followed for infrastructure necessary in Development of major ports? **[8]**
  - b) To make the projects viable/workable what are the facilities & services you will provide? **[8]**
- Q7)**
- a) What are the sources of financing adopted in case of NHDP projects by the Govt. of India? **[8]**
  - b) What are the internal sources of port trust in creating the required funds necessary for investment in further development? **[8]**
- Q8)** Write short notes on any three of the following: **[16]**
- a) Quality control system adopted in Infrastructure projects.
  - b) Merits & Limitations of BRTS project.
  - c) Sources of finance for modernization of Railways.
  - d) Alternative source of Energy.



Total No. of Questions : 6]

SEAT No. :

P4029

[Total No. of Pages : 2

[4860] - 160

M.E. (Electrical) (Control System) (Semester - II)

LARGE SCALE SYSTEM

(2008 Pattern) (Elective - III (c))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any 2 questions from each section.
- 2) Answer to the two sections should be written in separate books.
- 3) Neat diagrams must be drawn whenever necessary.
- 4) Figures to the right indicate full marks.
- 5) Your answer will be valued as a whole.
- 6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

**SECTION - I**

- Q1)** a) Discuss improved Davison's technique for model order reduction. [10]  
b) Discuss and explain the reduce order model using Chidambara technique. [10]  
c) What is large scale system? Explain its hierarchical structure? [5]

- Q2)** Find the Eigen value retained and ISE of third order system. [25]

$$X = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -10 & -17 & -8 \end{bmatrix} X + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u \text{ and } Y = [1 \ 0 \ 0]X$$

- Q3)** Explain the technique of moment matching and apply it to the following system

to obtain the order reduce model for  $G(S) = \frac{s^2 + 4s + 4}{s^3 + 4s^2 + 6s + 5}$ . [25]

P.T.O.



## SECTION - II

**Q4) a)** Explain the pole placement technique & explain how to choose Poles. **[12]**

b) Explain the concept of aggregation by continued fraction. **[13]**

**Q5)** Consider the system **[25]**

$$A = \begin{bmatrix} -2 & 0 \\ 1 & -1 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, R = \begin{bmatrix} 1 & 0 \\ 0 & 5 \end{bmatrix}, \lambda_1 = -2, \lambda_2 = -1$$

The Eigen values of optimal closed loop systems are specified as  $s_1 = -8, s_2 = -5$

**Q6)** Explain the first causer form, second causer form and third causer form for model reduction. **[25]**



Total No. of Questions : 6]

SEAT No. :

**P4030**

[Total No. of Pages : 2

**[4860] - 161**

**M.E. (Electrical) (Control System)**

**INTELLIGENT CONTROL**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Q1 and Q4 is compulsory.*
- 2) *Solve Q2 or Q3 and Q5 or Q6.*
- 3) *Figures to right indicate full marks.*
- 4) *Neat digrams must be drawn wherever necessary.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Answers to the two sections should be written in separate books.*

**SECTION - I**

**Q1)** Explain in detail historical information of ANN and also explain Biological inspiration for development of ANN. Draw necessary sketches. **[25]**

**Q2)** Draw Perceptron neuron model and explain it's activation function. Also give multilayer neuron model with neat sketch. **[25]**

OR

**Q3)** What is associative memory? Explain kohonan neural network with proper sketch. **[25]**

**SECTION - II**

**Q4)** What is Fuzzy Logic and Fuzzy Control system? Give composition rules. Also differentiate crisp logic and fuzzy logic. **[25]**

**Q5) a)** Explain in detail Mamdani Inference system. **[12]**

b) Explain load shedding using ANN. **[13]**

**P.T.O.**

OR

- Q6)** a) Explain Air conditioner controller using Fuzzy logic. [12]  
b) Explain in detail Sugeno Inference system. [13]



Total No. of Questions : 12]

SEAT No. :

**P4496**

**[4860] - 162**

[Total No. of Pages : 3

**M.E. Electrical (Control System)**

**b - ADVANCED DRIVES AND CONTROL**

**(503112) (2008 Course) (Semester - II) (Elective - IV)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if necessary.*
- 4) *Neat diagram must be drawn wherever necessary.*

**SECTION - I**

- Q1) a)** Explain following terms with reference to multi-quadrant operation of drive, **[9]**
- i) Regenerative braking operation.
  - ii) Plugging operation.
  - iii) Reversible operation
- b) State the factors affecting the starting time and energy during starting of the electric drive system. Write a note on "Thermal Model" of the motor. State and explain the importance in the heating and cooling cycle followed in the industrial applications like heavy - punching machines. **[9]**

OR

- Q2) a)** A load of constant torque is to be driven at variable speed below normal speed by the Induction motor. Suggest a suitable solid state controller. State and explain the criteria for Selection of the drive components so as to match the motor and the load. **[9]**
- b) Compare AC drives and DC drives from following point of view: **[9]**
- i) Available supply and nature of output voltage of the controller.
  - ii) Electric motor of the drive and controller selection.

**P.T.O.**

**Q3)** a) With reference to the performance of a chopper fed d.c.motor, discuss the cause, control and the effect of the following: [8]

Current ripple and Torque pulsation.

b) Develop the system model and the transfer function of the converter fed separately excited d.c.motor. [8]

OR

**Q4)** a) The following converters are used one by one to drive a d,c motor under no load condition at variable speed below normal speed. In each case, discuss the effect of the waveform of the armature current on the performance of the drive: [8]

i) Single phase half wave controller

ii) Single phase full wave controller

iii) Three phase half wave controller

iv) Three phase full wave controller

b) Discuss the comparison of converter fed DC drives and chopper fed DC drives. [8]

**Q5)** Write detail note on any two of the following: [16]

a) PWM inverter fed induction motor.

b) Current Source Inverter supplying induction motor.

c) Necessity of derating of induction motor fed from inverter.

OR

**Q6)** Explain with help of circuit diagram of control strategy, the technique of reversal of direction of rotation, complexities, no. of power components used in voltage source inverter. Also compare the Same if current source inverter is employed in speed control of induction motor. [16]

### **SECTION - II**

**Q7)** Explain the effect of variation of waveform of stator current supplied to the windings of Induction motor by [18]

a) Solid state variable voltage controller.

b) PWM inverter with constant V/f ratio.

OR

**Q8)** Write a note on following in detail with reference to induction motor: [18]

- a) Sensorless Vector Control.
- b) Direct Torque Control.

**Q9)** Explain with reference to synchronous motor: [16]

- a) Sinusoidal SPM machine drives.
- b) Permanent magnet motors with solid state controller.

OR

**Q10)** Explain the following: [16]

- a) Switched reluctance motor drive.
- b) Wound field machine drive.

**Q11)** In a closed loop control of the electric drive, explain and compare the performance of the PID controllers with reference to integral gain constant and delay time derivative gain constant. [16]

OR

**Q12)** Considering closed loop control of electric drive, explain in detail the following: [16]

- a) Phased lock loop control (PLL).
- b) Micro computer Control.



Total No. of Questions : 6]

SEAT No. :

P4031

[Total No. of Pages : 2

[4860] - 164

M.E. (Electrical) (Power System)

COMPUTER APPLICATIONS IN POWER SYSTEM

(2008 Pattern)

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Attempt any two questions from section - I & section - II.*
- 2) *Figures to the right indicate full marks.*

**SECTION - I**

**Q1)** a) Explain the optimization problem based on nature of equations involved. [8]

b) Find the solution of following optimization problem by using constrained variable method. [5]

$$\text{Minimize } f(x) = 4x_1^2 + 6x_2 + 5$$

$$g(x) = 3x_1 + x_2 - 3 = 0$$

c) Explain the multivariable optimization with equality constraints by the method of constrained variation. [12]

**Q2)** a) State the Kuhn Tucker conditions. [5]

b) What are the different Random search methods of unconstrained minimization? Explain any one. [10]

c) Explain steepest Descent method along with its flow chart. [10]

**Q3)** a) Explain the Newton Raphson method of load flow analysis (Polar form). Draw its flow chart. [13]

b) What are the methods of load flow under contingency conditions? Explain any one in details. [12]

**P.T.O.**

## SECTION - II

- Q4)** a) Explain classical method of economic dispatch considering limits. Draw flow chart. [12]  
b) Explain optimal power flow based on Gradient method. [13]
- Q5)** a) Explain three phase load flow analysis. [12]  
b) Explain :- [13]  
i) DC load flow  
ii) Power loss in a line and  
iii) Generation shift distribution factors with reference to loss coefficients using sensitivity factors.
- Q6)** a) Explain formulation of sequence impedance matrix in terms of self and mutual impedances using transformation matrix. [12]  
b) Explain A.C. - D.C. load flow analysis. [13]





Total No. of Questions : 6]

SEAT No. :

P4032

[Total No. of Pages : 2

[4860] - 165

M.E. (Electrical) (Power Systems)

**POWER SECTOR ECONOMICS MANAGEMENT &  
RESTRUCTURING  
(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *All questions carry equal marks.*
- 6) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 7) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Discuss various challenges before Indian Power Sector under going reforms. [8]
- b) Explain role of regulator in power system. Explain price cap and rate of return regulations. [9]
- c) Explain stages of tariff determination followed in India. [8]
- Q2)** a) For expansion and performance improvement of utility system an investment of Rs. 25 lacs is done in the initial year. With increased sale and efficient improvement utility is able to save Rs. 4 lacs annually over a span of 10 years. With discounting rate of 11% calculate net present value of investment option. [9]
- b) Explain role of Power Finance Corporation, Power Grid Corporation of India limited in strengthening infrastructural facilities. [8]
- c) With reference to power tariff explain desirable characteristics of tariff and also explain various tariff setting principles. [8]

**P.T.O.**

- Q3)** a) Give salient features of Electricity Act 2003. [8]  
b) What is public hearing? Also explain performance based regulation. [8]  
c) Explain factors influencing tariff for renewable energy sources. [9]

**SECTION - II**

- Q4)** a) Explain wholesale and retail competition models used in power market. [8]  
b) Explain terms price elasticity and demand elasticity. Also explain effect of these on power market. [8]  
c) What is congestion in power network? Explain probable reasons for congestion. Also explain most common method to avoid congestion. [9]
- Q5)** a) Explain following power markets and compare them Forward market and Future market. [9]  
b) Discuss locational marginal prices and spot pricing. [8]  
c) What are different ancillary services? How these are provided? [8]
- Q6)** a) Explain role of load dispatch centres, ISO in providing transmission facilities. [8]  
b) Explain process of market settlement. Explain various factors affecting market operations. [9]  
c) Explain different key players in power sector. [8]



Total No. of Questions : 6]

SEAT No. :

**P4497**

**[4860] - 166**

[Total No. of Pages : 1

**M.E. (Electrical) (Power System)  
POWER SYSTEM MODELLING  
(503203) (2008 Course) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** Derive the stator and rotor voltage and torque equations in dq0 frame of reference for a synchronous machine of model 1.1. Write down assumptions involve in it. **[25]**
- Q2)** What is the use of Park's transformation in power system modeling? State Clarke's transformation and Kron's transformation and write about their applicability. Also write down the relationship of these transformations with Park's transformation. **[25]**
- Q3)** Develop a mathematical model for a loss less, long transmission line. Then with the help of suitable assumptions, develop a nominal 'pi' model of the line. **[25]**

**SECTION - II**

- Q4)** a) Derive a mathematical model of a hydraulic turbine. **[12]**  
b) Derive a mathematical model of a phase shifting transformer. **[13]**
- Q5)** Write down the ways in which static load modeling can be represented. **[25]**  
Discuss about the assumptions and approximations involved in it.  
Also write down the model of Induction machine with assumptions.
- Q6)** State the types of excitation system employed for the alternators. Explain its working with the help of a neat block diagram. **[25]**



Total No. of Questions : 6]

SEAT No. :

P4033

[Total No. of Pages : 2

[4860] - 167

M.E. (Electrical) (Power System)

**DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS**

**(2008 Pattern) (Elective - I(a))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Figures to the right indicate full marks.*
- 2) *Solve any two questions from section I and any two questions from section II*
- 3) *Assume suitable data if necessary.*

**SECTION - I**

**Q1) a)** Explain the advantages of digital signal processing over analog signal Processing. [8]

b) Explain how discrete systems are classified as [9]

i) Linear and non-linear system.

ii) Causal and non-causal systems.

iii) Dynamic and static systems.

c) Explain and prove initial value and final value theorem for Z transform.[8]

**Q2) a)** Find the linear convolution of the following two sequences using circular convolution.

$$x(n) = \{1, 0, 4, -2\} \quad h(n) = \{1, -2, 3, 2\}$$

$\uparrow$                        $\uparrow$

[8]

b) Explain Radix 2 FFT-DIF algorithm [12]

c) State and prove any two properties of DFT [5]

**P.T.O.**

- Q3)** a) Compare FIR filters with IIR filters. [6]  
b) Obtain direct form and cascade form realization of the following FIR filter. [9]

$$H(z) = (1 + 9z^{-1} - 8z^{-2})(1 + 3z^{-1} - 2z^{-2}).$$

- c) Explain the concept of linear phase FIR filters and their types. [10]

### **SECTION - II**

- Q4)** a) Design Butterworth analog filter for the given specifications.

$$\alpha_p = 2\text{dB}, \Omega_p = 20 \text{ rad/sec}, \quad \alpha_s = 8 \text{ dB}, \Omega_s = 30 \text{ rad/sec} \quad [10]$$

- b) Explain the method of bilinear transformation for converting analog filter into digital filter. [8]  
c) Explain different realizations of IIR filters. [7]

- Q5)** a) Explain Harvard and Von Neumann Architecture in Digital Processors. [9]

- b) Explain following [16]  
i) Pipelining  
ii) Effect of finite word length  
iii) Multiple Access Memory  
iv) Data Address Generator

- Q6)** a) With the help of functional block diagram, explain the features of DSP 320C50 Processor. [16]

- b) Write a detailed note on 'DSP based harmonic measurement'. [9]



Total No. of Questions : 12]

SEAT No. :

**P4034**

[Total No. of Pages : 3

**[4860] - 168**

**M.E. (Electrical) (Power Systems)**

**ADVANCED POWER ELECTRONICS**

**(2008 Pattern) (Semester - I) (Elective - I(b))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain the Constructional features, characteristics and specifications of SCR and compare with MCT? [8]
- b) Explain constructional details of GTO to explain turn off capability in comparison to SCR. [8]

OR

- Q2)** a) Explain characteristics of IGBT in comparison to MOSFET. Why heat sink is used for mounting power devices? [8]
- b) What is SOA? Draw and compare MOSFET and BJT SOA. [8]

- Q3)** a) Explain operation of 3phase full bridge converter. Comment on harmonics generated on ac and dc side. How PWM control is used for harmonic control? [10]
- b) What is selective Harmonic Elimination ? Explain how 3<sup>rd</sup> harmonic elimination is achieved? [8]

OR

- Q4)** a) What are various transformer connections used for obtaining 12 pulse operations? Write expressions for ac harmonics. What is the advantage of using 12 pulse converter over 6 pulse converter? [10]

***P.T.O.***

- b) Explain 3 level voltage source converter (VSC) operation and comment on harmonics in output voltage. [8]

- Q5)** a) Draw neat circuit and explain working of self commutated CSC. [8]  
b) Compare CSC with VSC with help of circuit diagram, devices used and applications. [8]

OR

- Q6)** a) Explain working of line commutated CSC. [8]  
b) What are the advantages of CSC compared to VSC ? Explain with help of circuit diagram and Control techniques. [8]

### **SECTION - II**

- Q7)** a) What are different types of Multi level inverters ? Compare. [8]  
b) Draw neat circuit for 3 level capacitor clamped Multilevel inverter and explain how harmonic control is achieved? Which harmonics are eliminated? [8]

OR

- Q8)** a) Explain working of diode clamped multilevel inverter. What are advantages in comparison with other types? [8]  
b) What is the control technique for cascading operation of multilevel inverters to generate stepped output? [8]

- Q9)** a) What is the need for energy storage systems ? What are the factors of selection of Energy storage? What are various types of energy storage available? [10]  
b) Explain working principle of Superconducting Magnetic Energy Storage system.(SMES). [8]

OR

- Q10)**a) What is Active filter? What are types ? Compare series and shunt types. [10]  
b) Explain working principle of Flywheel energy storage system. [8]

- Q11)a)** Explain the need for transformations using d-q transformations? [8]
- b) What is active and reactive power expressions of 3 phase 4 wire system using Akagi's instantaneous power (pq) theory? [8]

OR

- Q12)a)** What are  $\alpha\beta$  transformations ? Write relations for 3 phase balanced voltage systems to obtain  $\alpha\beta$  components. [8]
- b) How Akagi's instantaneous power (pq) theory is used for reactive compensation? [8]





Total No. of Questions : 8]

SEAT No. :

**P3960**

**[4860] - 17**

[Total No. of Pages : 2

**M.E. (Civil) (Construction and Management)**

**INTERNATIONAL CONTRACTING**

**(2008 Pattern) (Elective - III (C))**

*Time :4 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from each section.*
- 2) Figures to the right indicate full marks.*

**SECTION - I**

**Q1)** Explain in detail the RFQ and RFP evaluation systems based on the World Bank guidelines, used for selecting the contractor in the International bidding of construction contracts. **[18]**

**Q2)** Discuss the 3 tier, risk analysis and mitigation approach to be used by any contracting venture which would enable it to generate the ROI expected from winning the International contract, during the implementation of contract phase. **[16]**

**Q3)** Discuss the “documentation” aspects with respect to the raising of the “construction claims” in an international contract which is necessary for the proper “determination” of the “claims”. **[16]**

**Q4)** Explain in brief, different types of the FIDIC documents useful on global contracts. **[16]**

**SECTION - II**

**Q5)** With statistical evidence justify the role of the DRB in the speedy, effective resolution of the international construction disputes and explain in detail the complete procedure of the DRB from concept to completion. **[4+14]**

***P.T.O.***

**Q6)** Comment on the learnings from the BASRAH Housing International Project executed in IRAQ w.r.t

- a) Formation and execution based on the JV. [3]
- b) Financial performance. [5]
- c) Contract implementation. [3]
- d) Problems faced and their solutions. [5]

**Q7)** Discuss the “Code of Ethics and Conduct” to be followed by the international arbitrators based on the UNICTRAL guidelines. How is it ensured that the arbitrators actually practice the professional cases based on moral, ethical norms? Highlight with examples. [10+6]

**Q8)** Discuss the importance of the following in an international contract implementation :

- a) Insurances for materials, labour, equipment/plant. [6]
- b) Using various softwares for an effective project management. [6]
- c) HR estimation, recruitment, costing, retention. [4]



Total No. of Questions : 6]

SEAT No. :

P4035

[Total No. of Pages : 2

[4860] - 170

M.E. (Electrical) (Power System)

RENEWABLE ENERGY SOURCES

(2008 Pattern) (Semester - I) (Elective - II(b))

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any two questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculators is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain the energy resources and their status as per Indian Scenario. [10]  
b) Write a note on energy and its environmental impacts. [5]  
c) Highlight on standalone and grid connected operation of wind energy. [10]
- Q2)** a) State and explain different types of Solar collector. [10]  
b) Write a note on the building integrated PV system. [5]  
c) Highlight on standalone and grid connected operation of solar system. [10]
- Q3)** a) Write a note on power extracted from wind. [5]  
b) Discuss on system components and types of turbine related to wind energy generation. [10]  
c) Explain the control systems and its design features for wind power system. [10]

**P.T.O.**

## SECTION - II

- Q4)** a) Discuss on selection criteria of resources of Hybrid system and its sizing. [10]  
b) Write a note on micro hydel plant. [8]  
c) Explain the ocean-thermal energy conversion systems. [7]
- Q5)** a) Explain the equivalent circuit and performance characteristics battery as storage device. [9]  
b) Write a note on Ultra Capacitors. [8]  
c) Explain the fly wheel energy relations. [8]
- Q6)** a) Write a note on Hybrid system considering different sources. [10]  
b) Highlight on critical parameters require for integration of grid with the system. [10]  
c) Discuss different parameters which affects power quality adversely. [5]



Total No. of Questions : 6]

SEAT No. :

**P4498**

**[4860] - 171**

[Total No. of Pages : 1

**M.E. (Electrical) (Power Systems)  
POWER SYSTEM DYNAMICS  
(503208) (2008 Course) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any two from each section.*
- 2) *Answer to the two sections should be written on separate answer books.*
- 3) *Assume suitable data if necessary.*
- 4) *Write down all the assumptions made.*

**SECTION - I**

- Q1)** a) Explain in detail analysis of transient stability using numerical approach. **[13]**  
b) Explain with the help of suitable example, the objectives and various methods of islanding. **[12]**
- Q2)** Derive the characteristic equation for single machine system with static exciter. Applying Routh's criterion, explain the analysis of dynamic stability for single machine system with static exciter. **[25]**
- Q3)** What is power system stabilizer (PSS)? Explain it with the help of neat block diagram. Explain the working of each component of PSS in detail. **[25]**

**SECTION - II**

- Q4)** Derive stator and rotor equation of synchronous generator represented by model 2.1 to analyze the dynamics of it. **[25]**
- Q5)** Explain the terms voltage stability and angle stability. Also, explain with the help of appropriate waveforms effect of AVR to analyze it. **[25]**
- Q6)** a) Derive an expression for power flow for a system consists of 'm' machines. **[13]**  
b) Derive an equivalent swing equation for two interconnected non coherent machines. The machines are having inertia constant  $H_1$  and  $H_2$  and load angles  $\delta_1$  and  $\delta_2$ . Prove that the equation of such case is equivalent to swing equation of single machine connected to infinite bus system. **[12]**



Total No. of Questions : 6]

SEAT No. :

P4036

[Total No. of Pages : 2

[4860] - 172

**M.E. (Electrical) (Power System)**

**POWER SYSTEM PLANNING AND RELIABILITY**

**(2008 Pattern)**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

**SECTION - I**

- Q1)** a) Explain definition of Load forecast. Explain factors affecting load forecasting. [8]  
b) Explain power system planning and it's need in Power System. [8]  
c) Explain Load Research in detail with neat sketches. [9]
- Q2)** a) Explain Intra polation and Extra polation technique. [8]  
b) Explain Importance of probability in planning. [8]  
c) Define reliability hence explain reliability indices for momentory & sustained interruptions. [9]
- Q3)** a) Explain Load growth characteristics. [8]  
b) Explain reactive power planning hence explain planning criteria. [8]  
c) Explain evaluation techniques used for reliability. [9]

**SECTION - II**

- Q4)** a) Explain integrated resource planning used in generation planning for reliability improvement. [8]  
b) Explain transmission planning functions with neat sketch. [8]  
c) Discuss distribution system reliability and also focus on it's improvement method. [9]

**P.T.O**

- Q5)** a) Explain importance of probability study required in generation planning hence explain various probability methods. [8]
- b) What are network reconfiguration and restoration methods? How reconfiguration is helpful for reliability improvement? [8]
- c) What is reliability cost? Focus on parameters affected due to reliability cost. [9]
- Q6)** a) Explain factors affecting interconnection under emergency assistance. [8]
- b) Explain transmission planning in detail. Also explain reliability indices specially oriented to transmission system. [8]
- c) What is the effect of bus - bar failure in evaluation of distribution system reliability [9]



Total No. of Questions : 6]

SEAT No. :

**P4499**

**[4860] - 173**

[Total No. of Pages : 2

**M.E. (Electrical - Power Systems)  
HIGH VOLTAGE POWER TRANSMISSION  
(2008 Course) (Semester - II) (503210)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Attempt any two questions from each sections.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** a) Write short note on following:

- i) Lightning overvoltage waveform. [4]
  - ii) Overvoltage due to lightning phenomenon and means to divert it. [8]
- b) i) Differentiate between Switching over voltage and Lightning overvoltage. [5]
- ii) Explain the means to minimize the switching over voltage. [8]

**Q2)** a) Explain the necessity of reactive power support/compensation. [5]

- b) Explain the methods of compensation of reactive power. [10]
- c) Explain the origin of radio interference. Why does the radio interference needed to be considered in line design. [10]

**Q3)** a) What are the reasons of variation in voltage magnitudes? Explain methods to control voltage? [8]

- b) Write short note on following. [17]
- i) Biological effects of electric field.
  - ii) Safe values of electric field
  - iii) Safety measures to avoid accidents under high voltage / fields.

**P.T.O.**



## SECTION - II

- Q4)** a) Compare EHV AC and HVDC Transmission system. [10]  
b) Explain the types of multi-terminal HVDC systems along with their control characteristics, configurations. [15]
- Q5)** Write short note on following: [25]  
a) Protection in HVDC system such as pole wise segregation.  
b) Clearing of DC line faults.  
c) Reenergizing, protection .of converters.
- Q6)** a) Explain the working and switching arrangements in a bipolar HVDC terminal and sequence of switching operations. [10]  
b) With neat block diagram and voltage and current waveforms, explain the connections of three phase six pulse and twelve pulse converter bridges.[15]



Total No. of Questions : 6]

SEAT No. :

P4037

[Total No. of Pages : 2

[4860] - 174

M.E. (Electrical) (Power System)

DIGITAL POWER SYSTEM PROTECTION

(2008 Pattern)

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) State advantages of numerical relays. [7]  
b) State sampling theorem. [5]  
c) Explain how digital filtering is done using IIR filter. [13]
- Q2)** a) Explain amplitude comparison relaying scheme used for digital protection of EHV / UHV transmission line based on travelling wave phenomenon. [13]  
b) Draw block diagram of complete hardware system for digital protection of transmission line. Explain function of each block. [12]
- Q3)** a) What are the faults in a synchronous generator? What are the causes of these faults? [6]  
b) Explain unit protection scheme used for synchronous generator. State & explain tripping criterion. [6]  
c) Explain digital protection of synchronous generator using injection of sub-synchronous component method. [13]

**P.T.O**

## SECTION - II

- Q4)** a) Explain magnetising inrush current phenomenon in a power transformer. What measures are taken in digital protection of transformer to avoid illeffect of magnetising inrush current. [13]
- b) Explain percentage differential relaying scheme used for transformer. State tripping criterion. What are reasons for taking high bias factor? [12]
- Q5)** a) Explain co-ordination criterion of directional instantaneous IDMT overcurrent relay for two treminal lines. [13]
- b) Write a note on integrated operation of national power system. [7]
- c) Write a note on computer graphics display. [5]
- Q6)** a) State assumptions made for conducting short circuit studies of a power system. [4]
- b) Develop algorithm for short circuit studies. [13]
- c) With reference to (b) above, explain & derive transformation to symmetrical components. [8]



Total No. of Questions : 12]

SEAT No. :

**P4038**

[Total No. of Pages : 2

**[4860] - 175**

**M.E. (Electrical) (Power Systems)**

**POWER ELECTRONICS APPLICATIONS IN POWER SYSTEMS (PEAPS)**

**(2008 Pattern) (Elective - III(b)) (Semester - II)**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) From fundamentals obtain expression for active and reactive power in a transmission line. [8]
- b) Compare Series compensation and Shunt Compensation? Explain any one method for Shunt compensation in detail along with diagram. [8]

OR

- Q2)** a) Explain with neat diagram FC TCR topology. [8]
- b) Classify different types of static power converter topologies used. Comment on the output, harmonic control and power converter control issues of different topologies used for reactive power compensation.[8]

- Q3)** a) What is the most suitable location for shunt compensation placement? Why? [8]
- b) With neat figure explain the principle of operation of Thyristor Controlled Reactor (TCR). Obtain the expression for effective reactive admittance and RMS value of fundamental and  $n^{\text{th}}$  harmonic current. [8]

OR

- Q4)** a) Discuss basic topologies used as SVC. [10]
- b) Compare FC TCR and TSC TCR based on characteristics offered. [6]

**P.T.O**

- Q5) a)** Explain TCSC with its V-I characteristics. Explain its Voltage control and reactance control modes of operation. [10]  
b) Draw V-I characteristics of TSSC and Explain its modes of operation. [8]

OR

- Q6) a)** Comment on control range and VA rating of STATCOM using V-I characteristics in Voltage control and reactive control mode of operation. [10]  
b) Draw and explain switching converter type series compensator functional diagram. [8]

**SECTION - II**

- Q7) a)** What is UPFC? Draw diagram to explain basic principle of operation of UPFC. [8]  
b) With the help of expressions and P-Q/ $\delta$  plots, comment on range of real and reactive power control of UPFC. [8]

OR

- Q8) a)** Explain functional control of shunt and series converter in UPFC. What are the different modes of operation? [8]  
b) Compare UPFC to shunt compensators. [8]

- Q9) a)** Explain principle of working for Dynamic Voltage Regulator / Restorer (DVR). [8]  
b) Explain principle of working of TCBR with the help of diagram and expressions. [8]

OR

- Q10) a)** What is TCPAR? Draw circuit diagram and explain its working modes. [8]  
b) Compare different FACTS controllers used for reactive compensation. [8]

- Q11) a)** What are various control strategies used in various FACTS devices? Discuss their comparative merits. [10]  
b) Compare ANN and Fuzzy logic controls. [8]

OR

- Q12) a)** What is Hysteresis control? Explain. [10]  
b) Comment on importance of coordination between different FACTS controllers. [8]



Total No. of Questions : 8]

SEAT No. :

P4039

[Total No. of Pages : 2

[4860] - 176

**M.E. (Electrical Power Systems)**

**POWER QUALITY ASSESSMENT AND MITIGATION**

**(2008 Pattern) (Elective - IV)**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) How power quality events are characterised as per IEEE standard 1159? [8]
- b) How grounding system is linking with power quality? Explain need of separate grounding for critical load. [8]
- Q2)** a) What is RMS voltage short term and long term variation? What are different ways by which voltage regulation is achieved? [8]
- b) Discuss various causes of transients produced due to system component switching. [8]
- Q3)** a) Explain various methods for obtaining magnitude of sag along with duration and phase angle. [9]
- b) Explain following in context to voltage sag.
- i) Area of vulnerability
  - ii) Phase angle jumps
  - iii) Equipment behaviour under sag. [9]

**P.T.O**

- Q4)** a) What is filker? How it is measured? Give end solutions to mitigate voltage sag. [8]
- b) Explain role of STATCOM, SVC and DVR in mitigating power quality problems. [8]

**SECTION - II**

- Q5)** a) Explain effect of harmonics on consumer equipments and power utility equipments. [9]
- b) Explain series and parallel resonance in presence of harmonics. Also state consequences of harmonic resonance. [9]
- Q6)** a) What are the approaches followed in power quality monitoring? Explain any one approach in detail. [8]
- b) With suitable block diagram explain general process of power quality monitoring. What precautions are required for transient events. [8]
- Q7)** a) Explain various indices used for assessment of power quality. [8]
- b) What is harmonic state estimation? Explain capacities of harmonic state estimation. [8]
- Q8)** a) Discuss harmonic production by utility equipments and commercial loads. [8]
- b) Explain principle of harmonic control. Explain any one type harmonic filter. [8]



Total No. of Questions : 6]

SEAT No. :

**P4500**

**[4860] - 177**

[Total No. of Pages : 2

**M.E. (Electrical - Power Systems)**

**b-PARTIAL DISCHARGES IN ELECTRICAL POWER APPARATUS  
(Elective - IV) (2008 Revised Course) (Semester - II) (Open)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each sections.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the reasons of occurrence of partial discharges in electrical insulation system. **[5]**
- b) Compare the phenomenon of Internal discharges with Surface discharges. **[10]**
- c) Explain the PD characteristics parameters, wave-form of individual PD pulse and the train of PD current pulses. **[10]**
- Q2)** a) Draw the diagram for complete straight detection circuit. **[6]**
- b) Explain the function of each of the components in the straight detection circuit. **[6]**
- c) Derive relationship between measured charge 'q' and partial discharge inception voltage in straight detection method. **[6]**
- d) Explain the relation between measured charge 'q' and actual charge 'q'. **[3]**
- e) What makes charge 'q' an attractive quantity for measuring discharges? **[4]**
- Q3)** a) Explain with necessity, various designs of screens. **[10]**
- b) Explain the role of Screen interrupters. **[5]**
- c) What is the procedure of measurement of screening efficiency, lead through bushings? **[10]**



## SECTION - II

- Q4)** a) Explain the effects of partial discharges on the performance. [18]
- i) Gaseous insulation material
  - ii) Liquid insulating material
  - iii) Solid insulating material.
- b) Describe the extent of damage due to time dependant occurrence of partial discharge. [7]
- 
- Q5)** a) Describe the travelling wave method for location of discharges in cables.[6]
- b) Explain the superposition error in the above discharge measurement.[8]
- c) How the superposition error can be limited? [5]
- d) Explain the acoustic method of discharge detection in the plastic cable.[6]
- 
- Q6)** Write short notes on [25]
- a) National and International Partial Discharge test specifications.
  - b) Methods of locating partial discharges,
  - c) PD location according to pulse spacing method.



Total No. of Questions : 8]

SEAT No. :

**P4501**

**[4860]-178**

[Total No. of Pages :2

**M.E. ( Electrical) ( Power Electronics & Drives)**  
**MODELING AND ANALYSIS OF ELECTRICAL MACHINES**  
**(2008 Course ) ( Semester -I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from section - I and three questions from section - II.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) What is a primitive machine? Explain the d-q model of Kron's primitive machine. Justify from the torque equation, the development of torque by two orthogonal fields. **[10]**
- b) Explain also the term ' Invariance of power as applied to transformation theory in Electrical machines. **[8]**
- Q2)** a) Discuss modeling of 3- phase induction motor in rotor reference frame. **[8]**
- b) Derive the transformations for currents between a rotating balanced 3-phase winding and ( d,q,o) winding. **[8]**
- Q3)** a) Explain how mutual inductances of armature winding are derived in a synchronous machines. **[10]**
- b) Explain Park's transformation relating the three phase currents of a synchronous machine to its corresponding d-q axes currents. **[6]**
- Q4)** a) A Induction motor 3- ph, 4 pole, 50 Hz develops a torque of 310 Nm at rated phase voltage of 220V. The three phase stator winding now replaced by 2 phase winding keeping number poles, number of turns and conductor size same. Will the motor able to operate? If so, compute: **[8]**
- i) Rated phase voltage of induction motor.
  - ii) The torque if the rated voltage supplied is same as obtained in i) from a 2-phe Hz supply.

***P.T.O.***

- b) Explain significance of various terms of obtained torque equation . Derive the equation for the electrical torque of the primitive machine. [8]

### SECTION - II

- Q5)** a) Using the dynamic model of a induction machine, derive the expression for the steady state torque of a induction motor. [8]

- b) Discuss the dynamic model of synchronous machine. [8]

- Q6)** a) Using impedance matrix of a 3- phase salient pole synchronous machine, derive the phase voltage equation under balanced steady state operation. Hence draw the phasor diagrams for the motor. [8]

- b) Write and explain voltage equation matrix of 3 phase induction machine in d-q frame. [8]

- Q7)** a) Explain machine inter- connection matrices for DC motor coupled with DC generator system. [10]

- b) A- 3 phase star connected 4- pole 50 Hz alternator gives an open circuit voltage of 11 kV when applied field voltage is 210 V. For a circuit resistance of  $0.16 \Omega$  calculate the amplitude of armature to field mutual inductance and motional inductance. [8]

- Q8)** a) Explain linearization of induction machine model equations. [8]

- b) Discuss Small displacement stability. [8]



Total No. of Questions :6]

SEAT No. :

**P4502**

**[4860]-179**

[Total No. of Pages :2

**M.E. ( Electrical) ( Power Electronics & Drives)**

**ENERGY MANAGEMENT AND POWER QUALITY IN ELECTRICAL DRIVES**

**(503302) (2008 Course ) ( Semester -I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Solve any two questions from section I and two questions from Section II.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of Calculator is allowed.*
- 5) Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain loading duties of induction motor and selection of motors. [15]  
b) Explain energy management using VFD in fans and pumps. [10]
- Q2)** a) Explain causes and effects of power quality disturbances. [15]  
b) Explain capacitor size and location fixation criteria and cause of power losses. [10]
- Q3)** a) How energy efficiency can be improved in refrigeration systems. [15]  
b) In brief explain cogeneration system. [10]

**SECTION - II**

- Q4)** a) Explain the term harmonics and corrective measures to be applied. [15]  
b) Write detail note on Power quality reliability indices. [10]

***P.T.O.***

- Q5)** a) Explain the high power factor pre- regulator. [15]  
b) Explain various transformer connections for improving power quality.[10]
- Q6)** a) Explain Shunt type Active power filter and reference signal generation. [15]  
b) Write a short note on different active and passive filters. [10]



Total No. of Questions : 8]

SEAT No. :

**P3961**

**[4860] - 18**

[Total No. of Pages : 2

**M.E. (Civil) (Construction and Management)**  
**THRUST AREAS IN PROJECT MANAGEMENT**  
**(2008 Pattern) (Open - Elective - IV (a))**

*Time :4 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from each section.*
- 2) Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** Perform SWOT analysis of the Real Estate Sector in India and elaborate the impact of the SMART CITY Development Projects of the GOI on it. **[18]**
- Q2)** With case studies, discuss the concept of project partnering, its advantages and how the partnering charter is formed. **[16]**
- Q3)** Elaborate the classification system of the PDRI of Residential Buildings and explain 2 PDRI elements in each category, with examples. **[16]**
- Q4)** What is CONQUASS? How Singapore Construction Industry is benefitted from its implementation? Discuss. **[16]**

**SECTION - II**

- Q5)** a) Explain the “Benchmarking” process for the competency of “An engineer should be able to read and interpret from the project drawings, monitor contractor’s work accordingly and certify” on a 10 point scale under 4 categories. **[10]**
- b) Discuss the “Closure” of “Competency gaps” based on a HR appraisal system, with proper examples. **[8]**

***P.T.O.***

**Q6)** Discuss how IQ, EQ and SQ are measured for constructional professionals. Explain the role of each quotient on a construction project. Suggest measures to enhance each quotient. **[8+4+4]**

**Q7)** Explain different “leadership styles” with examples. Comment on merits/limitations of each style with respect to the construction organisations/projects. **[10+6]**

**Q8)** Discuss the following :

- a) Limitations of fast track constructions. **[4]**
- b) Advantages of ISO 9001 QMS implementation. **[4]**
- c) Project Influence - Cost Relationships. **[4]**
- d) SWOT matrix-utility. **[4]**



Total No. of Questions : 6]

SEAT No. :

**P4040**

[Total No. of Pages : 2

**[4860] - 180**

**M.E. (Electrical) (Power Electronics And Drives)**

**503303 - POWER ELECTRONIC DEVICES AND CIRCUITS**

**(2008 Pattern) (Semester - I)**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any two questions from section I and two questions from Section II.*
- 2) Answer to two sections must be written in separate answer sheet.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of Calculator is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain need of driving circuit for SCR, IGBT, GTO, MOSFET. Explain in detail driving circuit for SCR, MOSFET. **[15]**
- b) Why power devices need di/dt, dv/dt and thermal protection. How these are provided to SCR, MOSFET. **[10]**
- Q2)** a) What is safe operating area. Explain with reference to MOSFET and IGBT. What is mean by latch up with reference to IGBT. **[15]**
- b) What is need of isolation between power circuit and control circuit. Explain different isolation circuits. **[10]**
- Q3)** a) A buck-boost converter has an input voltage of 9 V and an inductor of 10 mH. The magnitude of the average output voltage is 12 V at a switching frequency of 1KHz. Determine a) The duty cycle b) The magnitude of ripple inductor. **[15]**
- b) How dc-dc conversion is obtained. Explain type A and type B chopper with output voltage and current waveforms. **[10]**

**P.T.O**



## SECTION - II

- Q4)** a) Derive steady state equation for single phase converter for R and RL load. Explain effect of source inductance. [10]
- b) The single phase full converter has a R-L load having  $L = 6.5 \text{ mH}$ ,  $R = 5 \text{ ohm}$  and  $E = 10 \text{ V}$ . The input voltage is  $V_s = 230 \text{ V}$  at  $50 \text{ Hz}$ . Determine a) the load current  $I_{10}$  at  $\alpha = 60^\circ$  b) average thyristor current  $I_a$  c) the rms thyristor current  $I_R$  d) the rms output current  $I_{rms}$  e) the average output current  $I_{dc}$ . [15]
- Q5)** a) Explain operation of VSI fed three phase inverter in 180 degree conduction mode with sequence of switching. Draw phase voltage line voltage and pulse waveforms. [15]
- b) Compare different PWM control strategies for inverter. [10]
- Q6)** a) Draw and explain the control circuit block diagram for cycloconverter with noncirculating current mode. [10]
- b) What are advantages and disadvantages of ac voltage regulator. Explain three phase ac voltage regulator controller with R load necessary waveforms. [15]



Total No. of Questions : 12]

SEAT No. :

P4041

[Total No. of Pages : 3

[4860] - 181

M.E. (Electrical) (Power Electronics & Drives)

DSP AND ITS APPLICATIONS IN ELECTRIC DRIVES

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from section - I and three questions from Section - II.
- 2) Answer to two sections must be written on separate answer sheet.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Use of Calculator is allowed.
- 6) Assume suitable data, if necessary.

**SECTION - I**

- Q1)** a) State advantages of digital signals over analog signals. [8]  
b) Find linear convolution sum of the following two sequences using Matrix method -  
i)  $x(n) = \{1, 2, -1, -1, 3\}$ ;  $h(n) = \{1, 0, 1, -1\}$   
ii)  $x(n) = u(n) - u(n-3) + \delta(n-4)$   $h(n) = \{1, -1, -1, 1\}$  [10]

OR

- Q2)** a) Explain with example the classification of discrete time systems with one example each. [8]  
b) Explain sampling theorem. Explain concept of folding and aliasing. [10]
- Q3)** a) State and prove any four properties of z transform. [8]  
b) Determine the value of signal  $x(n)$  at  $n = 0$  and  $n = \infty$  [8]

$$X(z) = \frac{2z^2 + 0.25}{(z + 0.25)(z - 1)}$$

OR

- Q4)** a) Define Z - transform. Explain ROC. State the condition for existence of z transform. [6]

P.T.O

b) Determine the Inverse Z - transform of [10]

i)  $X(z) = \frac{z+4}{z^2-4z+3}$  for  $\text{ROC}|z|>3$  using Partial Fraction Expansion Method.

ii)  $X(z) = \frac{z+1}{z^2-3z+2}$  For casual sequence using Long Division Method.

**Q5)** a) Explain ideal low pass and high pass frequency filters with phase distortion and delay. [8]

b) Explain frequency response of single pole or zero system. [8]

OR

**Q6)** a) Explain concept of stability and causality with inverse system for first order and system with a zero in ROC. [8]

b) Explain generalized phase system (GLPS) with linear phase. [8]

### SECTION - II

**Q7)** a) State and prove any four properties of DFT. [8]

b) Obtain 4 point DFT of [8]

i)  $h(n) = 0.5^n \quad 0 \leq n \leq 2$   
 $= 0 \quad \text{otherwise}$

ii)  $h(n) = \{1, 0, -1, 1\}$

OR

**Q8)** a) Explain Radix 2 DIF FFT algorithm for computing 8 point DFT. [8]

b) How linear convolution is obtained from circular convolution. Obtain linear convolution using circular convolution  $X(n) = \{1, 2, -1, -2, 1\}$ ;  $h(n) = \{1, 1, -1\}$  [8]

**Q9)** a) State steps to design a digital filter using impulse invariance method. [8]

b) Design a digital low pass butterworth filter using bilinear transformation. Specifications of the filter are as follows  $f_p = 0.10\text{Hz}$ ;  $\alpha_p = 0.5\text{dB}$ ;  $f_s = 0.16\text{Hz}$ ;  $\alpha_s = 30\text{dB}$ ;  $F = 1\text{Hz}$ . [10]

OR

**Q10)**a) Explain hanning window method for design of FIR filter. [8]

b) Using a rectangular window technique design a low pass filter with passband gain of unity, cut off frequency of 1000Hz and working at a sampling frequency of 5kHz. The length of the impulse response should be 7. [10]

**Q11)a)** Obtain direct form I, direct form II, cascade form and parallel form of following system  $Y(n) = 3/8y(n-1) - 3/32y(n-2) + 1/64y(n-3) + x(n) + 3x(n-1)$  [8]

b) Write short note on any one [8]

i) DSP based speed control of Induction motor

ii) DSP based overvoltage protection

OR

**Q12)a)** Explain basic structures of FIR filters [8]

b) Write short notes on any one [8]

i) Power factor control using DSP

ii) DSP based spectrum analysis



Total No. of Questions : 6]

SEAT No. :

P4042

[Total No. of Pages : 2

[4860] - 184

**M.E. (Electrical) (Power Electronics And Drives)**

**FACTS AND HVDC (Elective - II)**

**(2008 Pattern)**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer two questions from section I and two questions from Section II.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*

**SECTION - I (FACTS)**

- Q1)** a) With the help of neat diagram explain the working of static VAR compensation. [13]
- b) Explain the working of TCSC & TCR. [12]
- Q2)** a) Why reactive power compensation is required in power system? Explain different methods used for reactive power compensation. [15]
- b) Explain the principle of operation of Thyristor Switched Capacitors (TCS) [10]
- Q3)** a) Write a short note on Unified Power Flow Controller. [12]
- b) What is need of FACTS controllers? Explain the working of STATCOM as a FACTS controller along with neat diagram. [13]

**SECTION - II (HVDC)**

- Q4)** a) Discuss the role of HVDC in modern power system. [12]
- b) Explain the different types of HVDC systems along with neat diagrams and their merits and demerits. [13]

**P.T.O**

- Q5) a)** Draw the diagram of a typical HVDC substation. Also explain the function of different parts of it. **[15]**
- b) Explain the working of 6 pulse bridge converter along with waveform. **[10]**
- Q6) a)** Discuss in brief the power flow control in HVDC link. **[13]**
- b) What are the different faults occurred in HVDC link? Also explain how to provide protection against it? **[12]**



Total No. of Questions :8]

SEAT No. :

**P4503**

**[4860]-186**

[Total No. of Pages :2

**M.E. ( Electrical) ( Power Electronics & Drives)**  
**CONTROLLED ELECTRICAL DRIVES**  
**(2008 Course ) ( Semester -II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from section - I and three questions from section - II.*
- 2) *Neat digrams must be drawn wherever necessary.*
- 3) *Assume Suitable data if necessary.*

**SECTION - I**

**Q1) a)** Discuss performance of a separately excited dc motor fed from three phase full converter. **[9]**

b) The armature resistance and inductance of a separately excited dc motor 210 V, 1400 rpm, 21 A are  $1.7\Omega$  and 11 mH respectively. The motor is fed from a semi - converter of 230 V, 50 Hz. **[9]**

What is the speeds if,

- i)  $\alpha = 36^\circ$  and torque = 20 N-m.
- ii)  $\alpha = 85^\circ$  and torque = 100 N-m.

**Q2) a)** A 230 V, 15A, 1200 rpm separately excited dc motor is operated under dynamic braking. Calculate the duty ratio of the chopper. The armature resistance of motor is  $1.2\Omega$  and braking resistance of  $20\Omega$ . **[8]**

b) Explain four quadrant chopper fed DC drive. **[8]**

**Q3) a)** Explain with a schematic block diagram, the V/F closed loop control of 3 phase induction motor **[8]**

b) With necessary diagrams, explain CSI fed induction motor drive. Discuss steady state and transient performance of this drive. **[8]**

**P.T.O.**

**Q4)** With necessary diagrams discuss.

- a) Four quadrant operation in a dual converter fed dc drive. [8]
- b) Regenerative braking of dc motor. [8]

**SECTION - II**

**Q5) a)** Explain Static kramer drive . State the merits of this method of speed control. [8]

- b) A Y- connected squirrel cage induction motor has following ratings and parameters. 400 V, 50 Hz, 4- pole, 1400 rpm,  $R_s = 1.6\Omega$  ,  $R_r' = 3\Omega$  ,  $X_s = X_r' = 4.5\Omega$  ,  $X_m = 40\Omega$  When it is controlled by a current source inverter, calculate. [10]

- i) Motor torque, speed and stator current when operating at 25 Hz and rated slip speed.
- ii) Inverter frequency and stator current for rated motor torque and motor speed of 1200 rpm.

**Q6) a)** Explain the method of rotor flux estimation in vector control scheme using voltage model and hence derive the estimating equations of rotor flux and rotor angle With necessary diagrams. [8]

- b) Write the d-q-0 model of induction motor and explain vector control principle. [8]

**Q7) a)** What is indirect vector control? Explain implementation schematic block diagram. [8]

- b) Discuss the dynamic model of separately excited dc motor and derive the transfer function for speed as output and the armature voltage as input. [8]

**Q8)** With necessary diagrams explain: [8 ×2 = 16]

- a) SRM drive
- b) Brushless dc drive.





Total No. of Questions : 6]

SEAT No. :

P4661

[Total No. of Pages : 2

[4860] - 188

**M.E. (Electrical) (Power Electronics And Drives)**  
**DESIGN OF POWER ELECTRONIC SYSTEMS**  
**(2008 Pattern)**

*Time :3 Hours]*

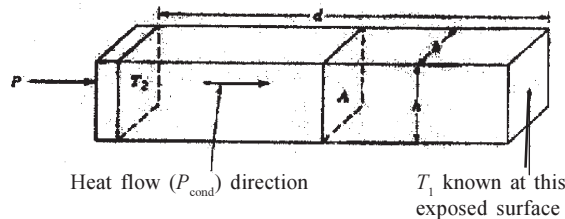
*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any two questions from Section - I and any two questions from Section - II.*
- 2) *Answers to the two sections should be written in separate answer sheet.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of Electronic Calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1) a)** The Aluminum rod shown in figure has following dimensions  $h = 1\text{cm}$   $b = 1\text{cm}$   $d = 20\text{cm}$ . the thermal conductivity of the aluminum rod is  $220\text{W.m}^{-1}\text{C}^{-1}$ . The rate of heat energy entering at the left end (where temperature is  $T_2$ ) is  $3\text{W}$  and The temperature at the right surface,  $T_1 = 40^\circ\text{C}$ . Find the temperature  $T_2$ . **[15]**



- b) Explain thermal resistance and its components. **[10]**
- Q2) a)** Explain with energy flow equation the different ways of heat transfers that are considered when designing a heat sink and explain the process of selection of a proper heat sink for a device **[15]**
- b) Derive transfer function of voltage control SMPS. **[10]**

**P.T.O**

- Q3)** a) Write a short note on modelling of a Buck converter. [15]  
b) Derive expression for specific eddy current loss. [10]

**SECTION - II**

- Q4)** a) With a flow chart explain the procedure of design of a single pass inductor assuming that the characteristics of all cores are available to the designer. [15]  
b) Explain the selection criterion of magnetic materials for different applications. [10]
- Q5)** a) Explain the need of soft switching and its concept with V - I characteristics. [15]  
b) Explain procedure for design of inverter. [10]
- Q6)** a) Explain procedure for designs of converter also explain what are different factors and assumption taken into account for design. [15]  
b) Explain the design procedure of transformer with flow chart. [10]



Total No. of Questions : 8]

SEAT No. :

P3962

[4860] - 19

[Total No. of Pages : 3

M.E. (Civil) (Hydraulics)

COMPUTATIONAL METHODS IN HYDRAULICS

(2008 Pattern)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer any three questions from each Section.
- 2) Answer to the two sections should be written in separate books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of logarithmic tables slide rule and non-programmable electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

**SECTION - I**

Q1) a) What is the classification of the equation  $\frac{\partial^2 f}{\partial x^2} + 2\frac{\partial^2 f}{\partial x\partial y} + \frac{\partial^2 f}{\partial y^2} = 0$ . [5]

b) Write down the finite difference analogue of the equation,  $u_{xx} + u_{yy} = f(x, y)$ .

Classify the equation  $(x+1)\frac{\partial^2 u}{\partial x^2} - 2(x+2)\frac{\partial^2 u}{\partial x\partial y} + (x+3)\frac{\partial^2 u}{\partial y^2} = 0$ . [6]

c) Explain how the finite difference method is used in Hydraulic Engineering. [6]

Q2) a) Solve the Laplace equation  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  at the pivotal points of the grid shown in the fig.2.a [9]

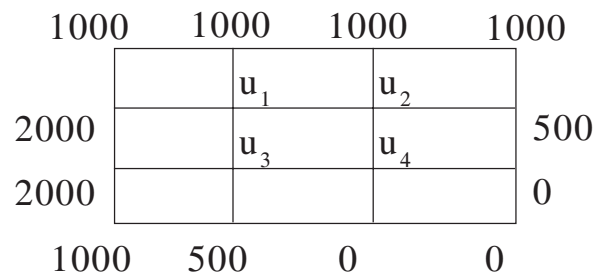


Fig.2.a

P.T.O.

- b) Solve the Poisson equation  $\nabla^2 u = -10(x^2 + y^2 + 10)$  over the square with sides  $x=0=y, x=3=y$  with  $u=0$  on the boundary and mesh length = 1. [8]

- Q3)** a) Explain the concept of correlation and regression. Define the Karl Pearson's correlation coefficient and discuss its important properties. [8]  
 b) An experiment gave the following values : [8]

$V(\text{feet/min})$	350	400	500	600
$T \text{ min}$	61	26	7	2.6

Here  $v$  and  $t$  are connected by the relation  $v = at^b$ . Develop this regression equation.

- Q4)** a) Fit a Binomial distribution of the following data and test for its goodness of fit at level of significance 0.05. [8]

$x$	0	1	2	3	4	5
$f$	38	144	342	287	164	25

- b) Explain : [8]  
 i) Markov Chain  
 ii) Markov process  
 iii) Simple and multiple regressions  
 iv) Beta  $\beta$  and Gamma  $\gamma$  distribution.

## SECTION - II

- Q5)** a) Discuss the transformation  $w = \sqrt{z}$ . Is it conformal at the origin. [5]  
 b) Find the transformation which maps the semi infinite strip of width  $\pi$  bounded by the lines  $v = 0, v = \pi$  and  $u = 0$  in to the upper half of the  $z$ -plane. [6]

- c) Use trapezoidal rule to evaluate  $\int_0^6 \frac{1}{(1+x^2)} dx$ . [6]

- Q6)** a) Use Simpsons 1/3 rule to find  $\int_0^6 \frac{e^x}{(1+x^2)} dx$  using seven ordinates. [8]  
 b) Explain Newton-Cote's quadrature formula and hence how you obtain different numerical integration rules. [8]

**Q7)** a) Use Cauchy's integral formula to evaluate  $\oint \frac{e^z}{(z+1)^2} dz$  where C is  $|z-1|=3$ . [8]

b) Solve the following system of simultaneous equations by relaxation method.

$$3x + 9y - 2z = 11; 4x + 2y + 13z = 24; 4x - 4y + 3z = -8. \quad [8]$$

**Q8)** a) Expand  $f(z) = \sin z$  in a Taylor's series about  $z = \pi/4$ . [5]

b) Use Gauss Quadrature three point formula to evaluate

$$I = \int_0^1 \frac{1}{x} \sin\left(\frac{1}{x}\right) dx. \quad [6]$$

c) Find the image of infinite strip  $1/4 < y < 1/2$  under the transformations  $w = 1/z$ , also show the regions graphically. [6]



Total No. of Questions :6]

SEAT No. :

**P4504**

**[4860]-191**

[Total No. of Pages :2

**M.E. ( Electrial) ( Power Electronics & Drives)  
c - MICROCONTROLLER APPLICATIONS  
( 503311) (2008 Course ) ( Semester -II) ( Elective - III)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any two questions from section - I and two questions from section - II.*
- 2) *Figures to the right indicate full marks.*

**SECTION - I**

**Q1) a)** Write note on

i) Reset circuit of 8051.

ii) Power down mode in 8051.

iii) AD converter.

[15]

b) Explain architecture of 8051.

[10]

**Q2) a)** Explain in detail interrupt structure of 8051 and toggle the LED connected at P1.1 through interrupt pin. [15]

b) Explain the generation of sawtooth wave using 8051. Program expected. [10]

**Q3) a)** Explain down cross assembler directives used in 8051. [15]

b) Write note on Queues and Macros. [10]

**SECTION - II**

**Q4) a)** Discuss interfacing of LCD to 8051. [15]

b) Explain stepper motor & drive operation using 8051. [10]

***P.T.O.***

- Q5)** a) Enlist any five sensors/ actuators and their interface with 8051. [15]  
b) Explain different modes of timer in 8051. [10]
- Q6)** a) Explain the 8051 based temperature measurement. [15]  
b) Write short note on protection of induction motor using 8051. [10]



Total No. of Questions : 6]

SEAT No. :

P4043

[Total No. of Pages : 2

[4860] - 193

**M.E. (Electrical Power Electronics And Drives)**  
**SPECIAL TOPICS IN POWER ELECTRONICS AND DRIVES**  
**(2008 Pattern) (Semester - II) (Elective - IV(b))**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any two questions from sections I and two questions from Section II.*
- 2) *Answer to two sections must be written on separate answer sheet.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain working of three phase inverter in 180 degree conduction mode with necessary pulses and output waveform. Explain different control techniques and compare them. **[15]**
- b) How variable output is obtained from inverter. What are different methods explain any one method. **[10]**
- Q2)** a) What are the advantages and disadvantages of CSI? Explain current regulated PWM CSI. Draw circuit diagram and output voltage, current waveform. **[10]**
- b) What different types of switching mode regulators? Explain any two in detail. **[15]**
- Q3)** a) Explain buck converter with output voltage and current waveform. What are advantages and disadvantages of buck regulator? **[10]**
- b) What is static VAR. Explain with circuit diagram and control technique VAR compensator. **[15]**

**P.T.O**



## SECTION - II

- Q4)** a) What are IEEE standards for power quality? [10]  
b) Show in detail implementation of single phase active filter and associated output. [15]
- Q5)** a) Explain vector control operation of three phase induction motor with block diagram and function of each block. [15]  
b) What is MRAS how it is used for synchronous motor control? [10]
- Q6)** a) What is sensor less control of Induction Motor? How it is achieved explain in detail . [15]  
b) What are different power quality aspects taken into account while designing power electronic circuit. [10]



Total No. of Questions :6]

SEAT No. :

P4505

[4860]-195

[Total No. of Pages :3

M.E. ( E &TC) ( Microwave)

ELECTROMAGNETICS AND ANTENNA THEORY

( 504222) (2008 Revised Course ) ( Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any two question from each section.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Use of calculator is allowed.
- 6) Assume Suitable data if necessary.

**SECTION - I**

**Q1) a)** The Electric field of an antenna is given by **[10]**

$$\vec{E} = \frac{\sin(4\pi \cos \theta)}{4\pi \cos \theta} \hat{a}_\theta.$$

Calculate :

- i) The direction of maximum.
  - ii) 3-dB Bandwidth.
  - iii) The direction and level of side lobe.
  - iv) The number of null in the pattern.
- b) The radial component of the radiated power density of an infinitesimal linear dipole of length  $l \ll \lambda$  is given by **[10]**

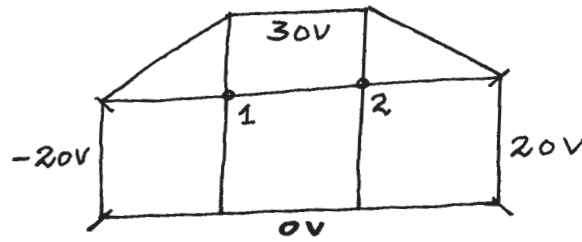
$$\vec{W} = A_0 \frac{\sin^2 \theta}{r^2} \hat{a}_r \text{ W/ m}^2$$

Where  $A_0$  is the peak value of the power density. Determine the maximum directivity of the antenna and express the directivity as a function of the directional angles  $\theta$  and  $\phi$ .

- c) Explain the wave polarization with relevant mathematical expressions and illustrative diagrams. **[5]**

**P.T.O.**

- Q2) a)** Use FDM method to calculate potentials at nodes 1 and 2 in the potential system shown in the following Figure. [15]



- b) Using method of moments, derive expression for field distribution using integral form of potential equation. [10]

- Q3)** Derive the field expressions for Half wave dipole from the current distribution and also state it's radiation pattern, power radiated, radiation intensity, radiation resistance, directivity. [25]

## SECTION - II

- Q4) a)** Explain the various analysis techniques for micro strip antenna with relevant diagrams, mathematical expressions and compare all the techniques. [10]
- b) Design a rectangular micro strip antenna using a substrate, with dielectric constant of 2.5,  $h = 0.1688$  so as to resonate at 9GHz. [10]
- c) Draw the structural diagram of circular patch antenna and explain its features and applications. [5]
- Q5) a)** Explain the Structural details, dimensions, radiation pattern, specifications, features and application of Rhombic Antenna and explain the design procedure. [10]
- b) A half wave dipole having radiation resistance of  $75\Omega$  is connected to the load through a transmission line such that the reflection coefficient is 0.75. Calculate the effective area given that the operating frequency is 100 MHz. [5]
- c) Derive the expression for Green's function G corresponding to PDE, for free space. [10]

- Q6)** a) What are the various numerical techniques to compute electric and magnetic fields? Explain finite difference method with suitable example. **[10]**
- b) Explain the procedure in finite element method with suitable illustrations. **[10]**
- c) Explain Yee's Algorithm and its application with suitable algorithm. **[5]**



Total No. of Questions : 8]

SEAT No. :

**P4044**

[Total No. of Pages : 2

**[4860] - 196**

**M.E. (E&TC/ Electronics)**

**Microwave/ VLSI Embedded Systems/Communication  
Network/ Signal Processing/ Digital Systems**

**PRINCIPLES AND PRACTICES FOR IT MANAGEMENT  
(2008 Pattern) (Semester - I)**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answers any three Questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Discuss planning & controlling as functions of Management in details. **[8]**  
b) Explain the prerequisites for planning of an IT project. **[8]**
- Q2)** a) Write short notes on tracking project progress and financial obligations. **[8]**  
b) Explain the role & importance of business policy. **[8]**
- Q3)** a) Explain the process of creating work break down structure (WBS). **[8]**  
b) Enlist various types of conflicts. Identify the techniques used for conflict management. **[8]**
- Q4)** Write short note on any three. **[18]**  
a) Skill required for Manager  
b) Business ethics  
c) Team management  
d) Theories of group formation

**P.T.O**

## SECTION - II

- Q5)** a) Discuss supply chain management as modern approach to management. [8]  
b) Explain the application of IT in agriculture sector. [8]
- Q6)** a) State and explain various project quality standards. [8]  
b) Explain the concept of knowledge management. [8]
- Q7)** a) Explain the process of creating budget in details. [8]  
b) Enlist various project constraints. Explain any one of them in detail. [8]
- Q8)** a) Discuss in detail Energy management and energy audit. [9]  
b) Write short notes on IPR and Cyber law. [9]



Total No. of Questions : 6]

SEAT No. :

P4045

[Total No. of Pages : 2

[4860] - 197

**M.E. (E&TC) (MICROWAVE)**  
**RF WAVE AND MICROWAVE CIRCUIT DESIGN**  
**RF And Microwave Integrated Circuits**  
**(2008 Pattern) (Semester - I)**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Solve any two questions from each section.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data, wherever necessary.*

**SECTION - I**

- Q1)** a) Explain in detail the working of p-channel MOSFET and its electronic applications. **[15]**
- b) Explain the concept of Inter Symbol interference (ISI) in microwave. **[10]**
- Q2)** a) Describe in detail operating principle of TUNNEL diode along with its equivalent circuit and characteristics. **[13]**
- b) An RF power BJT generates a total power  $P_w$  of 15W at case temperature of 25°C. The maximum junction temperature is 150°C and the maximum ambient operating temperature is specified by the user to be  $T_a=60^\circ\text{C}$ . What is the maximum dissipated power if the thermal resistance between case - to - sink and sink - to - air is 2°K/W and 10°K/W respectively? **[12]**
- Q3)** a) Explore the concept of sensitivity, conversion gain and dynamic range related to RF design. **[12]**
- b) Describe in detail operating principle of TRAPATT diode. **[13]**

**P.T.O**

## SECTION - II

- Q4) a)** A MESFET operated at 5.7GHz has the following S - parameters. [12]  
 $S_{11} = 0.5 \angle -60^\circ$ ,  $S_{12} = 0.02 \angle 0^\circ$ ,  $S_{21} = 6.5 \angle 115^\circ$ ,  $S_{22} = 0.6 \angle -35^\circ$   
i) Determine if the circuit is unconditionally stable.  
ii) Find the maximum power gain under optimal choice of reflection coefficients assuming the unilateral design.
- b) Explain in detail high power amplifier. [13]

- Q5) a)** Design a BJT colpitts oscillator for 200 MHz in common emitter configuration having bias point of  $V_{ce} = 3V$ ,  $I_c = 3\text{ mA}$ , following circuit parameters are given at room temperature of  $25^\circ\text{C}$ .  $C_{BC} = 0.1\text{PF}$ ,  $r_B = 2\text{K}\Omega$ ,  $R_{ce} = 10\text{K}\Omega$ ,  $C_{BE} = 10\text{PF}$ . IF the inductance should not exceed  $L_3 = L = 5\text{nH}$ . Find the values for capacitances in the feedback loop. [13]
- b) Explain working of crystal oscillator along with its equivalent circuit.[12]

- Q6) a)** Explain in details the concept of stability consideration related to amplifier design. [10]
- b) An RF amplifier has following S - parameters  $S_{11} = 0.3 \angle -70^\circ$ ,  $S_{12} = 0.2 \angle -10^\circ$ ,  $S_{21} = 3.5 \angle 85^\circ$ ,  $S_{22} = 0.4 \angle -45^\circ$ . Furthermore, the input side of the amplifier is connected to voltage source with  $V_s = 5V$  and source impedance  $Z_s = 40\ \Omega$ . [15]

The output is utilized to drive an antenna which has an impedance of  $Z_L = 73\ \Omega$ . Assuming that S - parameters of the amplifier are measured with reference to a  $Z_0 = 50\ \Omega$  characteristic impedance. Find the following quantities.

- i) Transducer gain  $G_T$ , Unilateral transducer gain  $G_{TU}$ , available gain  $G_A$ , operating power gain  $G$  and.
- ii) Power delivered to the load  $P_L$ , available power  $P_A$ , and incident power to the amplifier pine.





Total No. of Questions : 6]

SEAT No. :

**P4046**

[Total No. of Pages : 2

**[4860]-198**

**M.E. (E & TC) (Microwave)**

**APPLICATION OF MICROWAVE TO RADAR &  
SETELLITE (Elective - I)**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any 2 questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain kepler's law of orbital motion of a body in detail along with related expressions. **[13]**
- b) Explain with neat diagram the FDMA downlinks analysis. **[12]**
- Q2)** a) Explain the concept of synthetic Aperture RADAR (SAR) with illustrations, block diagram and its application. **[12]**
- b) What is RCS and how it is estimated? Explain with all relevant expressions. **[13]**
- Q3)** a) Derive the RADAR range equation considering all the losses. **[13]**
- b) Explain with relevant block diagram of the satellite subsystems. Telemetry, tracking, command, power subsystem. **[12]**

**P.T.O.**

## SECTION - II

- Q4)** a) Explain in detail the TT and C systems in satellite communication. [13]
- b) A receiving system consists of an antenna having a noise temperature of 60 K feeding directly into a LNA. The amplifier has a noise temperature of 120 K and gain of 45 dB. The coaxial feeder between the LNA and the main receiver has a loss of 2 dB, and the main receiver has noise figure of 9 dB. Calculate the system noise temperature referred to input. [12]
- Q5)** a) State and explain Kepler's law of planetary motion. [10]
- b) What are different satellite access techniques? Explain each one of it. [15]
- Q6)** a) Explain the power budget analysis in satellite links with suitable mathematical expression. [12]
- b) What is G/T ratio and explain its significance in satellite communication. [13]



Total No. of Questions : 8]

SEAT No. :

**P3963**

**[4860] - 20**

[Total No. of Pages : 2

**M.E. (Civil) (Hydraulics)**

**WATER RESOURCE PLANNING AND MANAGEMENT**

**(2008 Pattern)**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain “Water Resources Planning and development” with reference to the following points. [9]  
i) Necessity  
ii) Objectives  
b) List out and explain in brief, different types of data collected for a multipurpose water resources project [9]
- Q2)** a) List out various methods of benefit cost studies of water resource project. Discuss in detail benefit cost ratio method with suitable example. [8]  
b) Explain with suitable example “Irrigation Management Policy”. [8]
- Q3)** a) Explain necessity and objectives of “water users cooperative society”. [8]  
b) Explain “Engineering Aspect” related to water resources planning. [8]
- Q4)** a) The water resource project A and Z have planned to be constructed at Mumbai and Chennai respectively with the following parameters. Compare these two projects (A and z) and state which project (A or z) is feasible (suitable). Justify your answer.  
Take rate of interest = 11%. [8]

**P.T.O.**

Sr. No.	Parameter	Project 'A'	Project 'Z'
1.	Cost of Construction (₹)	$45 \times 10^6$	$90 \times 10^6$
2.	Annual maintenance & operation cost (₹)	8 lakh	15 lakh
3.	Annual Benefits (₹)	$6 \times 10^6$	$13 \times 10^6$
4.	Useful life of a Project (Yrs)	60	90

- b) Write short note on the following : [8]
- Social and Economic Aspect of water Resources Planning and Management.
  - Technological options for water resources development.

### SECTION - II

- Q5)** a) Discuss in detail various aspects of integrated approach in water resources engineering. [10]
- b) Discuss the concept and role of stakeholders in water management development plans. And also explain “Stake holder analysis - a tool for policy formation and implementation”. [8]
- Q6)** a) Discuss in detail the various parameters required for feasibility report. [10]
- b) Write short note on “Global Water Partnership”. [6]
- Q7)** a) Enlist the different bodies (commission) for water resources planning. Explain any one in detail. [8]
- b) Explain in detail “State water disputes”. [8]
- Q8)** a) Explain the procedure for formation of water users cooperative societies. [8]
- b) Explain in brief : [8]
- ICID
  - ICOLD



Total No. of Questions : 8]

SEAT No. :

**P4047**

[Total No. of Pages : 2

**[4860]-200**

**M.E. (E & TC) (Microwave)  
COMMUNICATION NETWORKS  
(2008 Pattern) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to right indicate full marks.*
- 5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the different functions which a network designer has to consider while designing and implementing a computer network. **[8]**
- b) Discuss the major issues a network designer must consider while designing and implementing a computer network. **[8]**

**Q2)** Messages independently arrive to a system at the rate of 10 per minute. Their Lengths are exponentially distributed with an average of 3600 characters. They are transmitted on a 9600 bps channel. A character is 8 bit long.

- i) What is the average service time ( $T_s$ )?
- ii) What is the arrival rate ( $A$ )?
- iii) What is service rate ( $D$ )?
- iv) What is the utilization of the server ( $U$ )?
- v) What is the probability that there are 2 messages in the system?
- vi) What is the average number of messages in the queue ( $Q$ )?
- vii) What is the average number of messages in the system ( $N$ )?
- viii) What is the average waiting time in the queue ( $T_w$ )?

**[16]  
P.T.O.**

- Q3)** a) Draw and explain the format of a frame Relay frame. [8]  
b) Explain the user oriented and network oriented attributes defining the quality of service (QOS) in an ATM network. [8]

- Q4)** Write short notes on: (Any Three) [18]  
a) Structure of a Network Design Tool.  
b) System with Both Loss and Delay (M/M/m/q).  
c) Distributed Networks  
d)  $I \rho \vee 6$

### SECTION - II

- Q5)** a) Explain the set of criteria used by National Institute of standards and Technology to evaluate candidates AES ciphers. [8]  
b) Draw and explain the three commonly used firewall configurations. [8]

- Q6)** a) List and briefly define the principle categories of Secure Electronic Transaction (SET) participants. [8]  
b) Differentiate between the wireless IEEE 802.11a & 802.11b standards. [8]

- Q7)** a) Draw and explain the protocol architecture of Bluetooth technology. [8]  
b) Compare the DES and AES algorithms used for security in communication networks. [8]

- Q8)** Write short notes on : (Any Three) [18]  
a) Wi-Max Technology  
b) Video Streaming  
c) Protocol analyser  
d) M/M/1 Queue



Total No. of Questions : 10]

SEAT No. :

**P4250**

**[4860]-201**

[Total No. of Pages : 2

**M.E. (E & TC) (Microwaves)**

**a-SMART ANTENNAS**

**(2008 Pattern) (Elective-II) (Semester-I) (504225)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Question Nos. 1 and 6 are compulsory. Out of the remaining attempt 2 questions from Section-I and 2 questions from Section-II.*
- 2) *Answers to the two Sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Derive the array factor of smart antenna as a function of Direction of arrival. **[10]**
- b) Differentiate between smart antennas and conventional antennas. **[8]**
- Q2)** a) Explain Vector Channel Impulse Response (VCIR) and spatial signature. **[8]**
- b) Explain dynamic re-sectoring in CDMA using smart antenna. **[8]**
- Q3)** a) Explain the beam forming networks in smart antenna systems. **[8]**
- b) How the spatial processing receivers are implemented using both analog and digital components. **[8]**
- Q4)** a) Explain how the smart antennas are used on the reverse link to improve the system's capacity in multi cell systems? **[10]**
- b) Describe the advantages and limitations of switched beam networks for different multiple access techniques. **[6]**

**P.T.O.**

- Q5)** a) Explain Downconversion and Channelization techniques for Software defined radio. [8]
- b) Derive MMSE approach for adaptive antenna systems. [8]

## SECTION-II

- Q6)** a) Prove the concept of range extension using smart antenna in CDMA through reverse link scenario. [10]
- b) Explain the principle of downlink beamforming technique for CDMA and its advantages and limitations. [8]
- Q7)** a) Describe the non coherent multi antenna combiner for CDMA base station receiver. [8]
- b) Explain spatial filtering Rake receiver for CDMA. [8]
- Q8)** a) Explain the importance of directional base station antennas in CDMA system. [8]
- b) Describe the effect of smart antennas over capacity of muticell CDMA systems. [8]
- Q9)** a) Describe the concept of spatial filtering at the subscriber unit. [8]
- b) How subscriber based spatial processing for the uplink can improve system capacity? [8]
- Q10)**a) Explain the capacity analysis in CDMA system through vector based approach. [8]
- b) Explain the importance of smart antennas in increasing the cell to cell isolation at subscriber unit. [8]





Total No. of Questions : 8]

SEAT No. :

P4048

[Total No. of Pages : 2

[4860]-202

**M.E. (E & TC) (Microwave) (Semester - I)**  
**SPEECH PROCESSING & APPLICATION**  
**(2008 Pattern)(Elective - II (b)) (Revised)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain the terms pitch frequency and formants. How will you find a pitch frequency? [8]
- b) Explain the method of zero crossing detection for classification of speech into voiced, unvoiced and silence part. [8]
- Q2)** a) Explain speech coding using DPCM. What is the need for an adaptive coding? Which parameters of speech change with time. [10]
- b) How will you select step size for unvoiced speech coding? If a dynamic range of 2 volts is coded using 4 bit quantization, find the quantization noise power. When a signal changes from unvoiced to voiced, how will you change the step size? [8]
- Q3)** a) Explain autocorrelation method for finding pitch frequency. Write the formula for autocorrelation. [8]
- b) What is sub band coding? Will it increase the bit rate? What is the advantage of coding different bands separately? [8]

**P.T.O.**

- Q4)** a) What is a cepstrum? Draw a block schematic to find a cepstrum of a speech segment? What is frequency domain? [8]
- b) What are formants? Can you use cepstrum to find formants? [8]

### **SECTION - II**

- Q5)** a) What is a bark scale? Draw a block schematic to find MFCC and explain the function of each block. [10]
- b) What is dynamic time warping? Explain the procedure to find DTW. [8]
- Q6)** a) Draw a block schematic for a speech recognition system. Explain different speech parameters used in speech recognition. [8]
- b) What is Hidden Markov model? Explain different probabilities required for evaluation in HMM. [8]
- Q7)** a) Explain the procedure for speech recognition using Neural network. [8]
- b) Why is the term speech synthesis used rather than speech generation? Which speech parameters are analyzed for synthesis? [8]
- Q8)** a) What is the difference between speech recognition and verification? Draw a block schematic for speech recognition. [8]
- b) What is the residual signal? Explain Linear predictive decoder using Levinson Durbin algorithm. [8]



Total No. of Questions : 8]

SEAT No :

**P4506**

**[4860] - 203**

[Total No. of Pages : 2

**M.E. (E & T/C) (Microwave)**

**C - SEMICONDUCTOR DEVICE MODELING & TECHNOLOGY**

**(2008 Course) (Elective - II) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explore drain & transfer characteristics of MOSFET in detail. Give significance of threshold voltage & formation of channel in enhancement type device. **[8]**
- b) What are the effects of real surfaces? Draw ac equivalent circuit of MOSFET & explain various parasitic capacitances available in different operating regions in detail. **[8]**
- Q2)** a) Draw ac equivalent circuit of BJT. Explain various parameters in detail. What are different performance parameters involved at high frequency? Which parameters put limitations at high frequency? **[8]**
- b) Explain various current components involved in the operation of BJT. What is their significance in various operating regions of BJT. **[8]**
- Q3)** a) With the concept of built-in-potential, junction & ohmic contacts; explain equilibrium condition in pn diode. Explore various current components. **[8]**
- b) Explain transient behaviour of pn diode. List various breakdown principles. Elaborate any one of them in detail. **[8]**

**P.T.O.**

- Q4)** Write short notes on any three. **[18]**
- a) Issues in MOSFET at high speed.
  - b) MOSFET fabrication techniques.
  - c) Junction diode current-voltage analysis in forward & reverse bias.
  - d) Schottky barriers.

**SECTION - II**

- Q5)** a) What is  $\lambda$  parameter? Explain layout design rules in detail. **[8]**  
b) What is need of Bi-CMOS? Explain the concept. Explore Bi-CMOS inverter in detail. **[8]**
- Q6)** a) Explore doping & diffusion processes in fabrication. **[8]**  
b) What is latch-up problem? What are solutions to it? **[8]**
- Q7)** a) What is necessity of SPICE model? List various SPICE parameters of BJT. **[8]**  
b) What are level of MOSFET parameters? Explore in detail. **[8]**
- Q8)** Write short notes on any three. **[18]**
- a) CMOS Inverter & voltage transfer characteristics.
  - b) Moore's law & MOSFET scaling.
  - c) Ion implantation.
  - d) Lithography process.



Total No. of Questions : 8]

SEAT No. :

**P4638**

**[4860] - 204**

[Total No. of Pages : 2

**MICROWAVE INTEGRATED CIRCUITS  
(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any three questions from each section*
- 2) *Figures on the right indicate full marks.*
- 3) *Assume Suitable data wherever necessary*

**SECTION - I**

- Q1)** a) Compare HMIC & MMIC. List advantages, disadvantages and applications of MMIC. [10]  
b) Design a circular microstrip antenna using a substrate (RT/duroid 5880) with a dielectric constant of 2.2,  $h = 0.1588$  cm (0.0625 in.) so as to resonate at 10 GHz. [6]
- Q2)** a) Enlist the methods for synthesis on nonlinear MICS. Explain any one in detail. [8]  
b) Explain multichip module technology. [8]
- Q3)** a) What do you mean by uncertainty and confidence in measurement [8]  
b) What are the technological steps involved in fabrication of hybrid integrated circuits. [8]
- Q4)** Explain operation of microstrip couplers, circulators and isolators in detail. [18]

**SECTION - II**

- Q5)** a) Draw the layout diagram and equivalent circuit of following microstrip components : [8]  
i) An equivalent split Wilkinson power divider  
ii) A quadrature ( $90^\circ$ ) hybrid branch line coupler  
b) Write a short note on MIC differential phase shifters. [8]

***P.T.O.***

- Q6)** a) Explain impedance and frequency scaling in filters. Explain low pass to high pass filter transformation. [10]  
b) Explain network matrix decomposition of the microwave circuit. [6]
- Q7)** a) Explain operation of single ended diode mixer. [8]  
b) Explain GaAs FET MMIC switches. [10]
- Q8)** Write short note on applications of MMICs to : [18]  
a) Radio system  
b) Satellite communication  
c) Broadcast system  
d) Future trends in MMICs.



Total No. of Questions : 8]

SEAT No :

**P4507**

**[4860] - 205**

[Total No. of Pages : 2

**M.E. (E & TC) Microwave  
SIGNAL PROCESSING FOR WIRELESS COMMUNICATIONS  
(2008 Course) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three Questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if required.*
- 5) *Use of scientific calculator is allowed.*

**SECTION - I**

- Q1) a)** Explain the following. **[8]**
- i) Maximum likelihood estimate.
  - ii) Likelihood and sufficiency.
  - iii) Gauss Markov Model
- b) Define probability distribution and density function. List the properties of the same. **[8]**
- Q2) a)** Explain the following distribution functions in detail with their properties, equations and characteristic curves. **[12]**
- i) Gaussian distribution.
  - ii) Uniform distribution.
  - iii) Exponential distribution.
  - iv) Binomial distribution.
- b) Explain the basic concept of matched filter. **[4]**
- Q3) a)** Explain Bayes detection and derive expressions for likelihood ratio. **[8]**
- b) Derive the correlation receiver structure for detection of known signals in white gaussian noise. **[8]**

*P.T.O.*

- Q4)** a) Explain the term hypothesis testing. Explain the difference between null and alternative hypothesis. [6]
- b) What is color noise? Derive the expressions for the detection of signals in colored noise and draw the receiver structure. [12]

### SECTION - II

- Q5)** a) Explain the basic structure of Wiener filter. Derive Wiener Hopf equation. Draw the error surface curve and explain its significance. [12]
- b) Explain how system modeling and inverse system modelling is done with adaptive filter. [4]
- Q6)** a) Explain the term intersymbol interference. Explain the causes of intersymbol interferences in a digital communication system. Explain how ISI can be removed. [8]
- b) Explain the basic concept of adaptive equalizer with the help of block diagram. [8]
- Q7)** a) What is power spectral density? Explain the difference between parametric and non parametric power spectrum estimation. [6]
- b) Explain the periodogram method of power spectrum estimation. [10]
- Q8)** Write short notes on (any three). [18]
- a) Spread spectrum communication.
- b) Radar target models.
- c) LMS algorithm.
- d) Adaptive filter.





Total No. of Questions : 8]

SEAT No. :

**P4049**

[Total No. of Pages : 2

**[4860]-206**

**M.E. (E & TC) (Microwave)**

**MOBILE COMMUNICATION - GSM & CDMA**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) Explain FDMA-FDD & TDMA-FDD systems with the help of a neat diagram. [10]
- b) What is frequency reuse in cellular communication. What are the advantages of this approach? [8]
- Q2)** a) Explain how directional antenna reduces the co-channel interference. [8]
- b) Draw and explain the architecture of GSM. [8]
- Q3)** a) Explain speech signal processing in GSM from transmitter to receiver. [8]
- b) Discuss various handoffs in GSM. [8]
- Q4)** a) Discuss how privacy & security is maintained in GSM system. [8]
- b) Explain: i) Traffic measurement units [8]
- ii) Grade of service

***P.T.O.***

## SECTION - II

- Q5)** Explain IS 95 CDMA standard along with its features, physical & logical channels. **[18]**
- Q6)** a) What is fading? Explain its type. **[8]**  
b) Write a note on Rake receiver. **[8]**
- Q7)** a) Explain OFDM. **[8]**  
b) Write a note on various wireless standards. **[8]**
- Q8)** a) Explain handoff procedure in IS-95 CDMA. **[8]**  
b) Explain call origination and call termination in IS-95 CDMA. **[8]**



Total No. of Questions :8]

SEAT No :

[Total No. of Pages : 2

**P4508**

**[4860] - 207**

**M.E. (E & T/C) (Microwave)**

**a - FIBER OPTICS COMMUNICATION**

**(Elective - III) (2008 Course) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain the advantages and disadvantages of fiber optic communication over wired Communication. [6]  
b) Explain the marking of OTDR in optical fiber communication. [6]  
c) Explain the Fusion splicing of optical fiber with neat diagram. [6]
- Q2)** a) Write note on attenuation in optical fiber. [8]  
b) A graded index fiber has the characteristics of  $N_1 = 1.5$  and  $\Delta = 1.71\%$ . For a link of 10 km in length, compute pulse spreading due to modal dispersion and determine maximum bit rate. [8]
- Q3)** a) Draw and explain the fabrication techniques of optical fiber. [8]  
b) The refractive index and the photoelastic co-efficient for silica are 1.5 and 0.22 respectively. The silica has an estimated isothermal compressibility of  $6 \times 10^{-11} \text{m}^2$  per Newton at 1400 K Temperature. Boltzman constant is  $1.381 \times 10^{-23}$  Joules per Kelvin. Determine the Theoretical attenuation in desible per kilometer due to the Fundamental Rayleigh scattering in silica at optical wavelength of 0.65 micro meter, 1.02 micrometer and 1.28 micrometer. [8]
- Q4)** a) Explain signal propagation in graded index fiber with wave guide equations. [6]  
b) Draw and explain the schematic of optical receiver. [10]

***P.T.O.***

## SECTION - II

- Q5)** a) Explain the concept of Tunable sources and tunable filters in OFC. [8]  
b) What is mean by link power budget? How to calculate the required length of fiber if rest parameters are given? [10]
- Q6)** a) Explain [8]  
i) BER.  
ii) Quantum Limit.  
b) Calculate the incident optical power necessary to achieve an SNR of 50dB at the receiver for the analog optical fiber system operating at wave length of one micrometer which has a post detection bandwidth of 5MHz. [8]
- Q7)** a) Draw optical power loss model for point to point link. Explain link power budget with suitable example. [8]  
b) A continuous 40 km long optical fiber link has a loss of 0.4 dB/km calculate. [8]  
i) What is the maximum optical power level that must be launched into the fiber to maintain the optical power level of 2 micrometer at the receiver end?  
ii) What is the required input power if the fiber has a loss of 0.6 dBkm?
- Q8)** a) Explain SONET/SDH networks with neat diagrams. [8]  
b) Explain in detail the concept of WDM. [8]



Total No. of Questions : 8]

SEAT No. :

**P4050**

[Total No. of Pages : 2

**[4860]-209**

**M.E. (E & TC) (Microwave)**

**EMI & EMC TECHNIQUES**

**(2008 Pattern) (Elective - III (C))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from section I and three questions from section II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of Electronic pocket calculator is allowed.*

**SECTION - I**

- Q1)** a) Derive the equation for voltage and current by solving Helmholtz equation for a transmission line. **[10]**
- b) Discuss Uncertainty and Confidence in measurements. **[8]**
- Q2)** a) With the help of neat diagram explain power ratio method for attenuation measurement. **[8]**
- b) Discuss important considerations when making attenuation measurements. **[8]**
- Q3)** a) Write note on principle of automated noise measurements. **[8]**
- b) Explain the terms: Noise Figure and Noise Temperature. **[8]**
- Q4)** a) What are the various equipments used for RF Voltage measurements? Explain any one in detail. **[8]**
- b) Discuss various applications of Spectrum Analyzer and Network Analyzer. **[8]**

**P.T.O.**

## SECTION - II

- Q5)** a) Explain how total power Radiometer can be used to measure the noise. [8]  
b) Discuss RFIC and MMIC measurement. [8]
- Q6)** a) Explain different elements of Network Analyzer with the help of block diagram. [8]  
b) Explain the significance of vector measurements. [8]
- Q7)** a) Discuss the different RF power sensing devices. Explain any one type of power sensor in detail. [8]  
b) With the help of diagram, explain working of Spectrum Analyzer. [8]
- Q8)** Write notes on: [18]  
a) Calibration standards for RF power measurements.  
b) Various types of noise.  
c) Couplers used in RF power measurements.



Total No. of Questions : 8]

SEAT No. :

**P4452**

**[4860] - 21**

[Total No. of Pages : 3

**M.E. (Civil - Hyd)**

**FLUID MECHANICS**

**(2008 Course) (501303) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Your answer will be valued as a whole.*
- 6) *Use of electronic pocket calculator is allowed.*
- 7) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Derive 3-D continuity equation in cylindrical polar coordinate system. **[10]**
- b) A source of strength  $10\text{m}^2/\text{s}$  located at  $(-1, 0)$  is combined with a sink of strength  $14\text{m}^2/\text{s}$  located at  $(1, 0)$ . Find the stream function and velocity potential. **[8]**
- Q2)** a) For laminar flow between two fixed parallel plates prove that the velocity profile is parabolic and the average velocity is two third of the maximum velocity starting with the Navier-Stokes equation. **[8]**
- b) Oil with density  $900\text{ kg/m}^3$  and viscosity  $0.18\text{ N-s/m}^2$  flows between two horizontal parallel plates  $10\text{mm}$  apart. A constant pressure gradient of  $-1000\text{ Pa/m}$  drives the flow. The upper plate is moving with a uniform speed, while the lower one is kept stationary. Find the velocity of the upper palte so that **[8]**
- i) the flow rate is zero.
  - ii) the shear stress at the upper plate is zero.

**P.T.O.**

**Q3) a)** Derive Von-Karman's integral momentum equation for boundary layer starting with Boundary Layer equations. [10]

b) Explain Boundary Layer Separation describing causes, effects and methods to reduce the thickness. [6]

**Q4)** Write short notes on (any four): [16]

a) Conformal mapping.

b) Relaxation technique.

c) Hydrodynamically smooth and rough boundaries.

d) Creeping flow.

e) Boundary layer over a flat plate

### SECTION - II

**Q5) a)** For steady 2-D turbulent flow between parallel plates kept at a 'h' apart derive equation for Boundary shear starting with Reynold's equation. [8]

b) Water at 20°C is flowing through a Hydrodynamically smooth pipe of diameter 20cm at the rate of 80 lit/s. The average height of roughness projections on the pipe surface is 0.2mm. Determine the [8]

i) friction factor.

ii) shear stress at the pipe surface.

iii) shear velocity.

iv) maximum velocity.

The density and kinematic viscosity of water at 20°C are 1000 kg/m<sup>3</sup> and  $1 \times 10^{-6}$  m<sup>2</sup>/s respectively.

**Q6) a)** Discuss Reynold's rule of averages. [8]

b) Write short note on probability density function and distribution function of a continuous random variable. [8]



**Q7)** a) Discuss Isothermal and adiabatic processes. Derive equations for Bulk modulus of elasticity in each case. [8]

b) Derive equation for stagnation temperature in compressible flow. [8]

**Q8)** a) Derive energy equation for compressible flow. [10]

b) Define Mach angle, transonic flow, hypersonic flow, shock wave. [8]



Total No. of Questions : 6]

SEAT No. :

**P4051**

[Total No. of Pages : 2

**[4860]-210**

**M.E. (E&TC) (Microwave)**

**SOFTWARE PROJECT MANAGEMENT**

**(2008 Pattern) (Open Elective (a))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Attempt any two questions from section - I and any two from section - II.*
- 2) Figures to the right indicate full marks.*
- 3) Use separate answer sheet for both section.*
- 4) Neat diagrams must be drawn wherever necessary.*
- 5) Assume suitable data wherever necessary.*

**SECTION - I**

- Q1)** a) Discuss the aspects to be considered while budgeting an IT project. What are the risks involved in these projects and how can these be taken care off? **[8]**
- b) Draw an Activity Network using either Activity on Node or Activity-on-Arrow network conventions for each of the following projects: **[9]**
- i) Choosing and purchasing Laptops
  - ii) Travel from Pune to Kanya Kumari
  - iii) Planning send off to Final year students
- c) Briefly explain the purpose of each of the stages in a software project plan. What is the critical distinction between a milestone and a deliverable? **[8]**
- Q2)** a) Explain why the process of project planning is iterative and why a plan must be continually reviewed during a software project. **[13]**
- b) What is PERT / CPM technique? How is this technique useful in software project planning? Explain it with suitable example. **[12]**

**P.T.O.**

**Q3) Write short notes on any Four: [25]**

- a) Stages in a software project plan.
- b) Object Oriented Software life cycle model.
- c) Software Project Teams.
- d) Work Breakdown Structure.
- e) Types of cost estimates.

### **SECTION - II**

**Q4) a) Explain categories of data function types. Also explain rules for identification. [12]**

- b) Briefly explain the purpose of each of the stages in a software project plan. What is the critical distinction between a milestone and a deliverable. [13]

**Q5) a) Group management is the most crucial aspect in any project management and when it comes to software projects its much more crucial". Justify the statement highlighting the important aspects to be considered. [16]**

- b) What are the problems faced in managing teams of professionals? How does this differ from managing teams of blue color workers? [9]

**Q6) Explain any four from following: [25]**

- a) Management and Strategic Management.
- b) Project Procurement management.
- c) Reasons for delays in project implementation.
- d) Return on investment.
- e) Assessing Project Viability.



Total No. of Questions :8]

SEAT No :

**P4509**

**[4860] - 212**

[Total No. of Pages : 2

**M.E. (E & T/C) (VLSI & Embedded Systems)**

**ANALOG AND DIGITAL CMOS IC DESIGN**

**(2008 Course) (504181) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Use different answer sheet for each section.*
- 2) *Attempt any 3 Questions from each section.*
- 3) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) What are the performance parameters of voltage reference circuit? Explore in brief. What is state of the art? [8]  
b) Explain in short: Implementation of current sink and current source using MOSFET. What are the voltage compliances? How to improve them?[8]
- Q2)** Design CMOS differential amplifier for CMMR=40dB. The dissipation should not exceed 2.5 mW at supply of 2.5V. [16]
- Q3)** a) Explain in detail the concept of BGR with its necessity. [8]  
b) Where and how the MOSFET is used as diode/Active Resistor? [8]
- Q4)** Write short notes on any three: [18]
- a) Active Load Invertors & its parameters.
  - b) Techniques used in Micro Power op-amp.
  - c) Current amplifiers.
  - d) Buffered op-amps using MOSFETs.

**P.T.O.**

## SECTION - II

- Q5)** a) What is MOS model? What are its objectives? How it is used by designers? [8]
- b) In CMOS technology why do we design the size of PMOS to be higher than the nMOS? Why PMOS and NMOS are sized equally in transmission gate? [8]
- Q6)** a) What is metastability problem in digital design? How to overcome metastability? [8]
- b) Derive an expression for Power Delay Product (PDP) and Energy Delay Product (EDP). How do PDP and EDP help CMOS designers? [8]
- Q7)** a) What are the constraints in FSM design? How to tackle them? Explain any one in detail. [4]
- b) Design a lift controller for 3 floor building. Assume standard specifications. Draw Minimized the state diagram. Write VHDL code for the same. [12]
- Q8)** Write short notes on any three: [18]
- a) High speed design techniques.
  - b) Low power design techniques.
  - c) CMOS parasitic.
  - d) CMOS layout techniques.



Total No. of Questions : 8]

SEAT No. :

**P4052**

[Total No. of Pages : 2

**[4860]-214**

**M.E. (E & TC - VLSI and Embedded System)**

**EMBEDDED SYSTEM DESIGN**

**(2008 Pattern) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) Explain various design metrics used to characterize an embedded system. [8]
- b) What are the different integrated circuit technologies used in embedded system? Compare ASICS and FPGA technologies. [8]
- Q2)** a) What are the features of ARM processors? Explain 5 - stage pipeline structure of ARMG processor. [10]
- b) What is the significance of cache memory? Explain different cache replacement policies. [8]
- Q3)** a) Describe load - store architecture using ARM core dataflow model. [8]
- b) Compare RISC and CISC architectures. [8]
- Q4)** a) Explain I2C protocol in detail with timing diagram. [8]
- b) Explain Hardware and software co-design flow in detail. [8]

***P.T.O.***

## SECTION - II

- Q5) a)** Write short note on (Any Three) **[18]**
- i) CAN Bus Protocol
  - ii) IDE tools in Embedded System
  - iii) Signal Integrity
  - iv) ARM Processor modes
- Q6) a)** Explain Bluetooth protocol and specify communication between two devices using state transition diagram. **[10]**
- b) Explain top-down design approach in Embedded systems. **[6]**
- Q7) a)** What are the different types of parallel buses used in Embedded? Explain Multiplexed bus in detail. **[10]**
- b) Explain physical design flow in detail. **[6]**
- Q8) a)** Explain AMBA Bus architecture in detail. **[8]**
- b) What are the different optimization characteristics adopted by Embedded system? Explain two techniques of power optimization. **[8]**



Total No. of Questions : 8]

SEAT No. :

P4053

[Total No. of Pages : 2

[4860]-215

M.E. (E & TC) (VLSI&Embedded System)

ASIC DESIGN AND MODELING

(2008 Pattern) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from each section.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data if necessary.

**SECTION - I**

**Q1)** a) Write a VHDL code using structural model for the following functions:[10]

$$F1 = AB' + A'BC$$

$$F2 = A' + B'$$

$$A3 = A \cdot B' + A' \cdot B$$

b) With the help of EDA tools explain the step by step process to explain the flow of ASIC design. [8]

**Q2)** a) Differentiate between full custom and semi custom ASIC. Brief in detail the semi custom ASIC structure. [8]

b) Explain different post-layout verification steps with neat diagram. [8]

**Q3)** a) Draw and explain fabrication process of IC chip layout. [6]

b) Explain step by step process of Hardware design verification. [10]

**Q4)** Write short note on: [18]

- a) Mixed signal design
- b) Clock tree synthesis
- c) Data structure for graph models

**P.T.O.**



## SECTION - II

- Q5)** a) Explain w.r.t. floorplanning: **[10]**
- i) Channel Capacity                      ii) Channel Density
  - iii) Channel Allocation                  iv) Cyclic constraints
  - v) Channel ordering
- b) Classify routing algorithm and explain any one with neat diagram and goals, one in detail. **[8]**
- 
- Q6)** a) Draw the block diagram of Design for Test and explain BIST in detail. **[8]**
- b) Explain in detail zero slack algorithm for placement. **[8]**
- 
- Q7)** a) Explain the term Back Annotation with goals and objectives explain VLSI Physical design flow. **[8]**
- b) Explain in brief various delay models. **[8]**
- 
- Q8)** Write short note on: **[18]**
- a) Static timing Analysis
  - b) Fault Simulation
  - c) EDA tools.



Total No. of Questions : 8]

SEAT No. :

**P4054**

[Total No. of Pages : 2

**[4860]-216**

**M.E. (E&TC) (VLSI Embedded System)**

**NANOTECHNOLOGY**

**(2008 Course) (Elective - I) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer to the two sections should be written in separate answer books.*
- 2) Answer any three questions from each section.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams must be drawn wherever necessary.*
- 5) Assume suitable data if necessary.*

**SECTION - I**

**Q1)** a) 'Biosystems is nothing but complex nanosystems', justify the statement. **[8]**

b) Justify the statement 'Bonds are key to nanotechnology'. **[8]**

**Q2)** a) Explain different structures of carbon Nanotubes. **[8]**

b) Discuss electrical and mechanical properties of CNT. **[8]**

**Q3)** a) How the concept of MEMS can be used for nanotechnology? **[8]**

b) How CNT is useful for medical applications? **[8]**

**Q4)** Write short note one (any three): **[18]**

- a) Nano imprint lithography
- b) Electron beam lithography
- c) Nanomachines
- d) Nanodevices
- e) Molecular and super-molecular switches

**P.T.O.**

## SECTION - II

- Q5)** a) Write differences between NEMS and MEMS. [8]  
b) Explain advantages and disadvantages of optical beam lithography over e-beam lithography. [8]
- Q6)** a) Role of nanotechnology in advanced computation. [8]  
b) How nanotechnology can be used for communication? [8]
- Q7)** a) Explain applications of nanotechnology in optics. [8]  
b) Explain Bio-medical applications of nano-electronics. [8]
- Q8)** a) Explain applications of nano sensors. [8]  
b) Explain application of nano-electronics as a sensor material with suitable example. [10]



Total No. of Questions : 8]

SEAT No. :

**P4055**

[Total No. of Pages : 2

**[4860]-217**

**M.E. (E & TC) (VLSI and Embedded Systems)**

**MACHINE INTELLIGENCE**

**(2008 Pattern) (Revised)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Answer 3 questions from section I and 3 questions from section II.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) What is membership function? How can a membership function be normalized? Explain different shapes of membership function. [8]
- b) Explain the following terms: [8]
- i) Fuzzy set and Crisp Set
  - ii) Strong alpha-cut
  - iii) Universe of Discourse
  - iv) Fuzzy rules
- Q2)** a) What is data clustering: Explain the fuzzy c-means clustering, Fuzzy c-means clustering? [8]
- b) What are different defuzzification methods used to obtain crisp output? Discuss the criterion for comparison and evaluation of these defuzzification methods. [8]
- Q3)** a) What are genetic algorithms? Describe any one application of GA? [8]
- b) Draw and explain the Adaptive Neuro-Fuzzy Inference system (ANFIS) architecture for Sugeno fuzzy model, where weight normalization is performed at the very last layer. [8]

**P.T.O.**

**Q4)** Write short note on (Any three): **[18]**

- a) Neuro Fuzzy control
- b) Soft computing Vs Artificial intelligence
- c) Principal Component analysis
- d) Least square methods for system identifications

### **SECTION - II**

**Q5)** a) Explain the following in detail: **[8]**

- i) Hebbian learning
  - ii) Competitive learning
  - iii) stochastic learning
- b) Explain the architecture of single layer perceptron and training algorithm used in perceptron. **[8]**

**Q6)** a) What is adaptive network? Describe in detail a multilayer perceptron and back propagation learning. **[8]**

b) Explain the application of neural network in image processing field? **[8]**

**Q7)** a) Explain the architecture of ART1 network. **[8]**

b) Explain principal involved in LVQ? With architecture, describe how LVQ nets are trained. **[8]**

**Q8)** Write a short note on (Any three): **[18]**

- a) SOFM
- b) Derivative based Optimization
- c) Simulated Annealing
- d) Dynamic Programming



Total No. of Questions : 8]

**P4675**

SEAT No. :

[Total No. of Pages : 2

**[4860] - 218**

**M.E. (E & TC) (VLSI & Embedded System)**

**RECONFIGURABLE COMPUTING**

**(2008 Pattern) (Elective - II(a))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:-*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data. if necessary.*

**SECTION - I**

**Q1)** With the help of detail block diagram, Explore the architecture of TSFPGA. Give its features, merits and limitations, How these limitations can be minimize? **[16]**

**Q2)** a) Why is configurable ALU said very close to reconfigurable device? Explain with suitable schematic. **[8]**  
b) What are the limitations of General Purpose Processor? Why evolution in it is necessary? What are the characteristics of ideal reconfigurable device? **[8]**

**Q3)** a) Give the growth equation for wire, channel and associated hardware in reconfigurable device design. **[8]**  
b) What is Rents rule? How will you apply it in design of your own reconfigurable device? **[8]**

**Q4)** Write short notes on any three: **[18]**  
a) Fixed function devices  
b) Status of current FPGAs.  
c) Vector Processor

**P.T.O.**

## SECTION - II

- Q5)** With the help of detail block diagram. Explain the architecture of DPGA. List its features, merits and limitations. **[16]**
- Q6)** a) Which method of instruction will you suggest for reconfigurable device? Why? Draw the schematic in detail to explore. **[8]**  
b) Explain the concept of peak performance density in RP space area model. **[8]**
- Q7)** a) What is context? Why are contexts important in reconfigurable devices? **[8]**  
b) Why is excess stress being given on optimization of interconnects? What are challenges in it? **[8]**
- Q8)** Write short notes on any three: **[18]**
- a) MATRIX.
  - b) Fine-grained and Coarse-grained structure.
  - c) Temporal Partitioning algorithm.
  - d) Interconnect hierarchy.



Total No. of Questions : 10]

SEAT No. :

**P4056**

[Total No. of Pages : 2

**[4860]-219**

**M.E. (E & TC) (VLSI & Embedded System)**

**MEMORY TECHNOLOGIES**

**(2008 Pattern) (Elective - II(b))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer 3 questions from Section I and 3 questions from Section II.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Draw and explain SRAMS circuit using six MOS Transistors. [8]  
b) Draw and explain the Advanced SRAM architecture. [8]
- Q2)** a) Define Dual-port SRAMS mechanism? What are the features? Draw typical dual-port SRAM cell. [8]  
b) Write short note on Nonvolatile SRAMS. [8]
- Q3)** a) Draw and explain the application specific DRAM in details. [8]  
b) What are the external circuit are required to generate the control signals to operate the DRAM? [8]
- Q4)** a) What do mean by OTP EPROM? What are its advantages and disadvantages? [8]  
b) Explain the following parameter with suitable diagram. [8]  
i) Bipolar SRAM  
ii) BiCMOS DRAM

**P.T.O.**



- Q5)** a) Write a short note on Silicon Oxide Insulator (SOI) Technology. [9]  
b) What are the parameters which should be taken into account while designing SRAM and DRAMS? [9]

**SECTION - II**

- Q6)** Write short note : [16]  
a) Memory Cards.  
b) Digital Tablet PC.  
c) LCD.  
d) DVD Player.
- Q7)** a) Draw and explain the Pseudo Random Resting of DRAM memory. [8]  
b) Explain the Test Algorithm GALPAT for semiconductor memory testing? [8]
- Q8)** a) What are the application of Gallium Arsenide FRAM's in Memory Technology also explain the advantages and disadvantages of it? [8]  
b) What is Magneto Resistive Random Access Memories? What are the application of MRAMS? [8]
- Q9)** a) Give a comparison in between FRAM, MRAM and SRAM. [8]  
b) What are the parameters are considering while design a memory. Justify answer with considering various memory types? [8]
- Q10)** a) What are the different faults can occur in a memory chip and explain in brief? [9]  
b) What are the Memory Testing and Reliability Issues? Explain in details.[9]



Total No. of Questions : 8]

SEAT No. :

**P3964**

**[4860] - 22**

[Total No. of Pages : 2

**M.E. (Civil) (Hydraulics)**  
**REMOTE SENSING AND G.I.S. IN WATER RESOURCES**  
**ENGINEERING**  
**(2008 Pattern) (Semester - I) (Elective - I)**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Use of calculator is allowed.*
- 5) Assume suitable data if necessary.*
- 6) All questions are compulsory.*

**SECTION - I**

- Q1)** a) Discuss the principles of photogrammetry and its applications in water resources. [5]  
b) Write an essay on Fundamentals of Remote Sensing System. [5]  
c) Write a note on Electromagnetic Spectrum. [3]
- Q2)** a) State and Explain the Displacement Law. [4]  
b) Discuss in detail the interaction of EMR with 'Atmosphere'. [4]  
c) Describe the stages of Remote Sensing with neat sketch. [3]
- Q3)** a) Describe the important features of LANDSAT images. [3]  
b) State the elements of image interpretation in short. [5]  
c) What are FCC images? Write its advantages. [5]
- Q4)** a) Discuss various characters of IR images. [3]  
b) Discuss the methods used corrections in images. [5]  
c) Write a note on Concept of Analog and Digital System. [5]

**P.T.O.**

## SECTION - II

- Q5)** a) Describe in brief Geographical Information System (GIS). [5]  
b) Write in brief the Components of GIS. [5]  
c) Discuss in short buffering. [3]
- Q6)** a) What are Map Projections? [4]  
b) Write a note on Raster Data Structure. [4]  
c) Describe Supervised and unsupervised classification. [3]
- Q7)** a) Discuss Errors in GIS. [3]  
b) Describe Spatial and Attribute Database. [5]  
c) Write an essay on Data collection and input processing in G.I.S. [5]
- Q8)** a) Explain RS application in Canal irrigation with flow chart. [3]  
b) Write in short the software's used in GIS for Water Resources. [5]  
c) Explain in brief 'TIN'. [5]



Total No. of Questions : 8]

SEAT No. :

P4057

[Total No. of Pages : 2

[4860]-221

M.E. (E & TC) (VLSI & Embedded System)

REAL TIME OPERATING SYSTEM

(2008 Pattern)

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Describe various software architectures used in Embedded system. [12]  
b) What are the features of RTOS? Differentiate between Traditional O.S. & RTOS. [6]
- Q2)** a) Describe the different software development tools used in Embedded system development. [10]  
b) Explain memory management in RTOS. [6]
- Q3)** a) Explain various techniques used for inter-process communication. [10]  
b) Explain important guidelines for optimization of memory need/code optimization. [6]
- Q4)** a) What are the different software development process life cycle model? Explain any one model in detail. [8]  
b) Explain priority inversion and priority inheritance related with RTOS. [8]

**P.T.O.**

## SECTION - II

- Q5)** a) Explain the features of  $\mu$ COS-II O.S. [8]  
b) What are the requirements of porting the  $\mu$ COS-II O.S.? [8]
- Q6)** a) Explain the different functions used in  $\mu$ COS-II to handle semaphores. [8]  
b) Explain mailbox related to RTOS. Write 'C' code for mailbox handling in  $\mu$ COS-II. [8]
- Q7)** a) Explain how the Integrated Development Environment (IDE) tool supports the development of Embedded systems. [10]  
b) What are the salient features of Linux Kernel. [6]
- Q8)** Write short notes on following (any three) : [18]  
a) Rate monotonic scheduler.  
b) Kernel structure used in RTOS.  
c) File manipulation functions in Linux/RT Linux.  
d) Memory management functions in  $\mu$ COS-II.



Total No. of Questions : 8]

SEAT No. :

**P4058**

[Total No. of Pages : 3

**[4860]-222**

**M.E. (E & TC) (VLSI & Embedded Systems)**

**EMBEDDED SIGNAL PROCESSING**

**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*

**SECTION - I**

**Q1)** Answer in short :

**[16]**

- a) Under what condition, the result of convolution and correlation will be same.
- b) When we say, "DCT has high energy compaction", what do mean by that?
- c) For a similar input, the result of DFT and FFT are same, then why do we prefer FFT over DFT?
- d) How is Short Time Fourier Transform (STFT) a midway between Fourier transform and Wavelet transform.

**Q2)** a) In relation to DFT, explain the significance of Zero padding for different cases. What are its different advantages? **[8]**

- b) With the aid of suitable block diagram and mathematical support, explain sampling rate conversion by a rational factor  $3/2$ . **[8]**

**P.T.O.**

- Q3) a) Compute the iteration bound for the following DFG's (figure 1 and figure 2): [10]

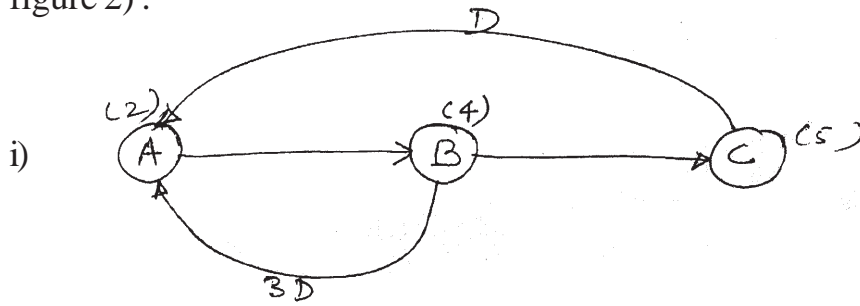


figure 1

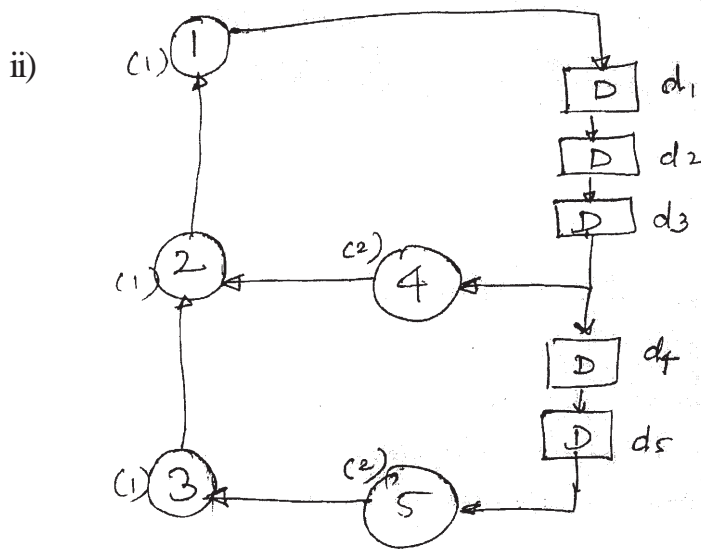


figure 2

- b) With the help of suitable example, explain pipelining of FIR digital filter. [8]

- Q4) a) If a FIR filter can be given mathematically as : [10]  
 $y[n] = x[n] + 2x[n-1] - 4x[n-3]$

Why do we need to represent it graphically? What are the advantages of graphical representation of DSP algorithms? For the above equations represent it using:

- i) Block diagram
  - ii) Signal Flow Graph (SFG)
  - iii) Data Flow Graph (DFG)
- b) Perform circular convolution between following sequences: [6]  
 $x[n] = [1, 2, 5]$  and  $h[n] = [1, 1]$

## SECTION - II

- Q5)** Answer in short : **[16]**
- a) What is the significance of MAC Block (Multiplier and Accumulator block) in any DSP Processor?
  - b) What is Adaptive in adaptive algorithms?
  - c) Pipelining leads to reduction in critical path? State true or false, justify your answer in short.
  - d) In the generation of DTMF signal, we require two IIR filters. Why one is not sufficient?
- Q6)** a) Explain windowing concept of designing FIR filter, also explain Gibbs phenomenon involved in that. **[10]**
- b) What is Retiming and why it is required? Describe various properties of retiming. **[6]**
- Q7)** a) Explain the concept of adaptive filtering, explain the same with any one example. **[8]**
- b) Explain the concept of finite word length effects and coefficient quantization. **[8]**
- Q8)** a) Explain the VLIW architecture used in DSP Processors? **[8]**
- b) With the help of architecture of any DSP processor, explain the following: **[10]**
- i) Barrel shifter.
  - ii) Cache memory.
  - iii) MAC.
  - iv) Memory management.





Total No. of Questions : 8]

SEAT No. :

P4059

[Total No. of Pages : 2

[4860]-223

M.E. (E & TC) (VLSI & Embedded System)

RF IC DESIGN

(2008 Pattern)

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain Johnson noise as applied to RF amplifiers. Give the expression for noise figure. Compare with white noise. [8]
- b) With schematic & mathematical expressions explain multiplier & square law MOSFET mixers in detail. [8]
- Q2)** a) Design CMOS amplifier for BW of 100 MHz Assume suitable data. [10]
- b) With suitable schematics explain LF & RF models for MOSFET. What is SPICE model? What are the dynamic elements? List high frequency figures of merit. [8]
- Q3)** a) What subthreshold operating region? Explain the effects of short channel. [8]
- b) With the suitable schematic explain CS tuned amplifier. Explain incremental model & admittance parameters. [8]
- Q4)** a) With suitable example explain back gate bias effect. [8]
- b) Write Short Note on Cross talk mitigation techniques. [8]

**P.T.O.**

## SECTION - II

- Q5)** a) Give the necessary expressions to support the effect of cascading on gain bandwidth. Explain super regenerative amplifier. [8]  
b) Why are S parameters preferred in RF microwave amplifiers? Explore S matrix in detail. [8]
- Q6)** a) Why is EMC important in RFIC design? List the techniques to achieve EMC while chip design. What specific cares are to be taken while layout of chip? [8]  
b) Design LNA to operate at 500 MHz Design suitable bias. Compute device width degenerating inductance, noise figure & Lg. Assume suitable data. [8]
- Q7)** a) Discuss role of Poles in amplifier. [8]  
b) Comment on effects of technology scaling on RF amplifiers. [8]
- Q8)** Write short notes on (any Three) : [18]  
a) Sources of EMI.  
b) RFIC design flow.  
c) EDA tools in Analog IC design.  
d) AM-PM Conversion.



Total No. of Questions : 8]

SEAT No. :

**P4060**

[Total No. of Pages : 2

**[4860]-224**

**M.E. (E & TC) (VLSI & Embedded Systems)**

**FAULT TOLERANT SYSTEM DESIGN**

**(2008 Pattern) (Elective - III)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What is Bridging fault model? Explain it's working with its advantages & disadvantages. [8]
- b) What are static Hazards? Explain the procedure for detecting static Hazards in combinational circuits. Also construct AND Gate using combinational logic. [8]
- Q2)** a) Explain in detail concurrent fault simulation technique. [8]
- b) What is unknown logic value? Explain how to construct a Truth Table for 2 input XOR Gate. [8]
- Q3)** a) Classify in detail different fault models. Specify their advantages and disadvantages. [8]
- b) What is physical segmentation & Logical segmentation? Explain. [8]
- Q4)** Write short notes on following : [18]
- a) Delay Models.
  - b) Fault Coverage.
  - c) Random Test Generation.

***P.T.O.***

## **SECTION - II**

- Q5)** a) What is Fault Equivalence and Fault Location in combinational circuit? Explain. [8]  
b) What is controllability & observability? Explain controllability and observability using scan based DFT technique? [8]
- Q6)** a) Explain with step by step process the procedure to test sequential circuit with and without faults. [8]  
b) Explain the following terms wrto Fault Modeling. [8]  
i) Fault Equivalence  
ii) Fault Dominance
- Q7)** a) What are the different compression techniques? Write the features of compression techniques. Also explain its necessary. [8]  
b) Differentiate between on-line and off-line BIST. Explain in detail the OFF line BIST architecture at the board level. [8]
- Q8)** Write short notes on following : [18]  
a) Wired logic Mechanism.  
b) Path sensitization.  
c) ATG Systems.



Total No. of Questions : 10]

SEAT No. :

P4673

[Total No. of Pages :2

[4860]-225

**M.E. (E & TC) (VLSI & Emb. System)**  
**BIOMEDICAL SIGNALS & SYSTEMS**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Maximum Marks : 100*

*Instructions to the candidates:*

- 1) *Answer Any Three questions from each Section.*
- 2) *Answer to the two sections must be written in separate answer sheets.*
- 3) *Black figures to right indicate full marks.*

**SECTION - I**

- Q1)** a) Define & explain following biomedical signals & draw their nature also. [8]  
i) ECG  
ii) EMG  
iii) EEG  
iv) PCG  
b) Explain the action potential &  $N_a^+$  -  $K^+$  pump action. [8]
- Q2)** a) Distinguish between ensemble & temporal (time) averages. Identify application of first & second order averages of both types in EEG analysis. [8]  
b) Propose a time domain technique to remove random noise, given the possibility of acquiring multiple realizations of the ECG signal or event of interest. [8]
- Q3)** a) Explain the following in reference to cardio-vascular system [6]  
i) Heart rate variability  
ii) Arrhythmia  
iii) Myocardial Infraction  
b) Explain 10-20 electrode system for acquiring EEG signal. [10]
- Q4)** a) Explain the genesis of PCG signals. Also explain their correlation with ECG signal. [9]  
b) Explain any one technique for ECG 'QRS' detection. [9]

**P.T.O.**

- Q5)** a) Explain time domain technique to remove base - line drift in ECG signal using derivative based operator. [8]  
b) Explain butterworth LPF for high frequency noise removal, also explain design steps for the same. [8]

### **SECTION - II**

- Q6)** a) Explain the operations involved in homomorphic filter & state it's applications for any biomedical signal. [8]  
b) State & explain four measures to characterize QRS complexes according to it's morphology. [8]
- Q7)** a) Explain the techniques of point processes parametric system modelling with simple example [8]  
b) State & explain the signal flow diagram of AR model with appropriate example. [8]
- Q8)** a) Explain any one technique for envelop extraction & analysis of any appropriate bio-signal activity. [8]  
b) Explain the importance of poisson random processes in bio-medical signal analysis. [8]
- Q9)** a) Explain adaptive segmentation also explain application of adaptive segmentation in EEG signals. [8]  
b) Explain with example unsupervised & supervised pattern classification. [8]
- Q10)** Write short notes on (Any Two) [18]  
a) Logistic Regression Analysis  
b) Spectral modeling & analysis of PCG signal  
c) Application of Neural network in biomedical signal analysis.



Total No. of Questions : 8]

SEAT No. :

**P4061**

[Total No. of Pages : 2

**[4860]-226**

**M.E. (E & TC) (VLSI & Embedded Systems)**

**ADVANCED DIGITAL SYSTEM DESIGN**

**(2008 Pattern) (Elective - III(c)) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Draw block diagram of ULTRA SPARC RISC  $\mu$ processor & explain it with features. **[8]**
- b) Draw block diagram 486 Bus model & explain timing diagram for Intel 486 basic 2-2 bus cycle in detail. **[8]**
- Q2)** a) Draw address & data path architecture of CPU indicating names of various blocks. Which unit of CPU sequences the data path operation? How are they implemented? **[8]**
- b) Model 64K  $\times$  8 Dual port SRAM using VHDL. **[8]**
- Q3)** a) With proper example analyze the circuit for hazard and redraw a hazard free circuit for the same. **[8]**
- b) Describe ATM packet generator in detail with appropriate sketch. **[8]**
- Q4)** Write notes on any three : **[18]**
- a) ASM & its applications
  - b) Clock skew & problems caused by it.
  - c) ATM cell decoding.
  - d) Design issue of CISC & RISC architecture.

**P.T.O.**

## SECTION - II

- Q5)** a) Explain the boundary scan technique with the help of block schematic.[8]  
b) Develop a pseudo code for bit counting circuit & draw its ASM chart.[8]
- Q6)** Design a sequential circuit that computes a product of two 4 bit numbers. Design multiplication algorithm & state diagram of control for add & shift multiplier. [16]
- Q7)** a) With neat block diagram, explain the circuit which is implemented in digital system to test its own functionality without application of external input signal. [8]  
b) What do you mean by reliability? What is measure for reliability? Explain how is it calculated for a digital system with 'n' components each with different failure rate. [8]
- Q8)** Write notes on any three : [18]  
a) Design for Testability.  
b) Metastability.  
c) Need of Synchronization & methods to achieve it.  
d) Operation of 2×2 array of SRAM cell.





Total No. of Questions : 8]

SEAT No. :

**P4062**

[Total No. of Pages : 2

**[4860]-227**

**M.E. (E & TC) (VLSI & Embedded Systems)**

**EMBEDDED AUTOMOTIVE SYSTEMS**

**(2008 Pattern) (Open Elective - IV(a)) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What are ECU? Explain their significance in modern vehicles. [8]  
b) Which are the rating and efficiency of battery? What are the various tests on batteries and how charging is done? [8]
- Q2)** a) How onboard diagnostic system is achieved? [8]  
b) Explain the role of embedded system in automotive systems. [8]
- Q3)** a) How fuel metering is done? Which are different techniques? [8]  
b) What are different types of sensors? Explain any two sensors used in automotive systems. [8]
- Q4)** Write a Short Note on (Any three) : [18]  
a) Electromagnetic interference suppression.  
b) Open loop and closed loop systems.  
c) Current trends in automobile.  
d) Electronic dashboard instruments.

**P.T.O.**

## SECTION - II

- Q5)** a) Explain recent advances in automotive systems [8]  
i) GLS  
ii) GPSS  
iii) GMS
- b) Which are different safety measures taken using embedded system in modern vehicles. [8]
- Q6)** a) Draw a schematic arrangement for a typical CAN network containing a master and number of slaves. How microprocessor communication is possible. [8]
- b) Explain the following system in modern vehicle. [10]  
i) Lane change assistance  
ii) Night Vision  
iii) Rear camera assistance  
iv) Parallel parking assistance  
v) Curve over speed counter measure
- Q7)** a) Explain role of artificial intelligence in engine management. [8]
- b) Briefly explain the technique of integrated engine control and exhaust emission control technique? [8]
- Q8)** a) Explain the role of throttle position sensor in engine control unit. [8]
- b) Discuss in brief the electronic spark ignition control. [8]



Total No. of Questions : 8]

SEAT No. :

**P4063**

[Total No. of Pages : 2

**[4860]-228**

**M.E. (E & TC) (VLSI & Embedded Systems)**

**SYSTEM ON CHIP**

**(2008 Pattern) (Elective - IV(b))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *For metal-2:  $C_{metal-2, plate} = 0.02fF/\mu m^2$ ,  $C_{metal-2, fringe} = 0.06fF/\mu m$*
- 5) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) What do you mean by design abstraction? Explain it one example. [8]  
b) Explain “dogleg” algorithm with an example. What are advantages of this algorithm on its other counterparts? [8]
- Q2)** a) Explain the role of buffer(s) in RC transmission line. [8]  
b) Define layout routing? How automatic layout routing is playing important role in CMOS fabrication? [8]
- Q3)** a) What kind of economic turbulence is taken place in evaluation of IC technology with respect to Moors law? [8]  
b) Justify how channel density changes with pin placement with example.[8]
- Q4)** Explain with an example following adders and compare them over look ahead carry
- a) Carry slip adder. [6]
  - b) Carry select adder. [6]
  - c) Manchester carry chain. [6]

**P.T.O.**

## SECTION - II

- Q5)** a) Compute and plot the Elmore delay for metal-1 wire of size  $2000\lambda \times 4\lambda$  using : **[8]**  
i) 2-sections  
ii) 4-sections  
iii) 8-sections
- b) What do you mean by false path? How to avoid this problem in CMOS VLSI design? **[8]**
- 
- Q6)** a) Explain logical factorization for low power with example. **[8]**  
b) Explain : **[2 × 4 = 8]**  
i) Multiplexed latch.  
ii) Re-circulating latch.
- 
- Q7)** a) Show how bit serial adder adds the two nibble, A = “0101” and B = “0110” (first bit is MSB). Show the adders input and outputs for every clock cycle until the addition is complete. **[8]**  
b) Explain rat’s net plot algorithm? What are limitations of this algorithm?**[8]**
- 
- Q8)** a) What are requirements of clocking in pipeline? **[3]**  
b) Give specifications of Kitchen Timer. Describe co-design (software and hardware) issues of kitchen timer. Explain Kitchen timer floor plan and also discuss area and speed issue in detail. **[15]**



Total No. of Questions : 10]

SEAT No. :

**P4064**

[Total No. of Pages : 2

**[4860]-229**

**M.E. (E & TC) (VLSI & Embedded System)**

**SOFTWARE DEFINED RADIO**

**(2008 Pattern) (Elective - IV(c))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain the concept and need of Software radio. List the advantages of software defined radio over existing wireless technologies. [8]  
b) Explain hardware architecture of SDR. [8]
- Q2)** a) Write typical characteristics and explain benefits of SDR. [8]  
b) Explain design principles of SDR. [8]
- Q3)** a) Explain what are Worldwide frequency band plans. [8]  
b) What are the modulation techniques employed in SDR? [8]
- Q4)** a) What factors should be considered while selecting the RTOS in development of Software radio? [8]  
b) What are different development tools used in Software radio? [8]

**P.T.O.**

- Q5)** Write Short notes on (Any three) : **[18]**
- a) Cognitive Radio Forum.
  - b) SDR hardware development issues (FPGA/CPLD/ASIC)
  - c) SCA and JTRS compliance.
  - d) Core Framework.

**SECTION - II**

- Q6)** a) What is smart antenna? Explain any one architecture of antenna. **[8]**  
b) State adaptive algorithms used in smart antenna. Explain any one in brief. **[8]**
- Q7)** a) Why is it important for the RF components in an antenna array to have uniform characteristics across the channels? **[8]**  
b) Explain system propagation loss with neat block diagram. **[8]**
- Q8)** a) What is SPEAK Easy System? Describe. **[8]**  
b) What is selection criterion for selecting antennas in SDR? **[8]**
- Q9)** a) Explain the implementation of low cost SDR platform? **[8]**  
b) What are the military applications of SDR? **[8]**
- Q10)** Write short notes on (Any two) : **[18]**
- a) CORBA.
  - b) Joint Tactical Radio System.
  - c) Future of SDR.



Total No. of Questions : 12]

SEAT No. :

P3965

[4860] - 23

[Total No. of Pages : 4

**M.E. (Civil) (Hydraulics)**  
**DAM ENGINEERING**  
**(2008 Pattern) (Elective - I(b))**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section - I.*
- 2) *Solve Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section - II.*
- 3) *Answer any 3 questions from each section.*
- 4) *Answers to the two sections should be written in separate books.*
- 5) *Neat diagrams must be drawn wherever necessary.*
- 6) *Figures to the right indicate full marks.*
- 7) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 8) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Calculate the maximum and minimum normal stress intensities at the base of the dam section shown in fig- 1 when the reservoir is i) empty and ii) full. Neglect earthquake effect. Also calculate sliding factor and shear friction factor of safety. Assume shear strength 35 kg/sq. cm, coefficient of friction  $\mu$  as 0.75 and weight of concrete 2400 kg/m<sup>3</sup>. [10]

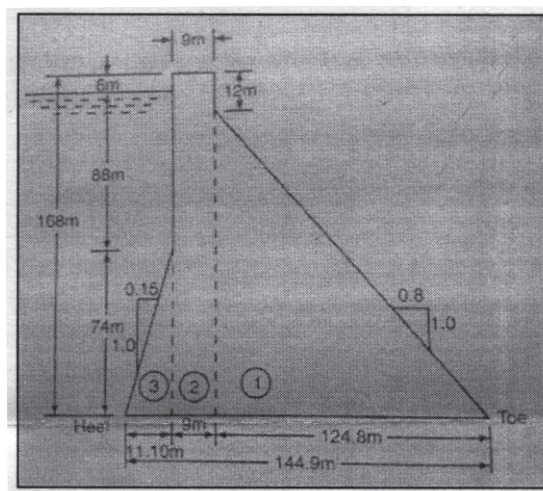


Fig-1

**P.T.O.**

- b) Enumerate various forces acting on gravity dam. Give the expression for each of them. [4]
- c) Write short note on construction and contraction joints in gravity dam. [4]

OR

- Q2) a) Write short note on earthquake pressure in gravity dams. Explain in detail effect of horizontal and vertical acceleration. [8]
- b) Explain elementary profile of gravity dam with neat sketch. Also discuss the stress intensities in elementary profile. [6]
- c) What are the different methods of stability analysis of gravity dam? Explain analytical method in detail. [4]

- Q3) a) What are salient features of an arch dam and different types of arch dam? Derive an equation for best central angle of arch dam. [10]
- b) Explain the design criteria for arch dam. [6]

OR

- Q4) a) What are the different methods of design of an arch dam? Explain thin cylinder theory in detail. [10]
- b) What are the limitations of thin cylinder theory? [6]

- Q5) a) Draw a typical section of an earth dam and explain the functions performed by each component. [8]
- b) A homogeneous earth dam has a section as shown in fig-2. It is provided with a horizontal filter 20 m long on the D/S side. Draw the base parabola and indicate the adjustments required to obtain phreatic line from it. [8]

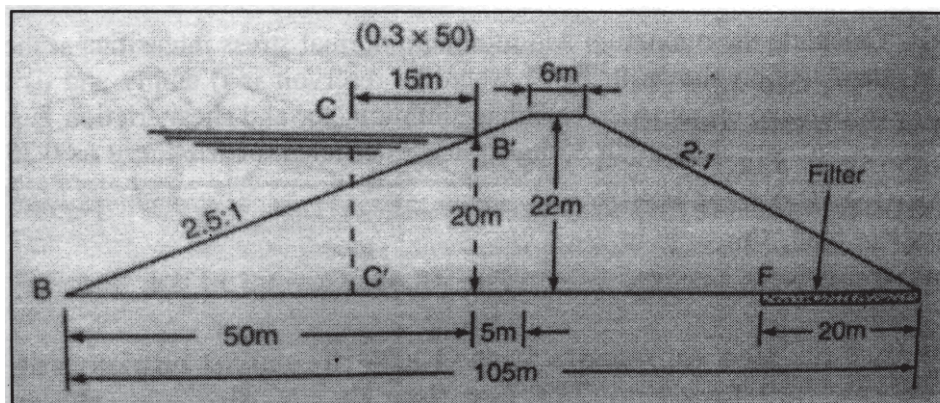
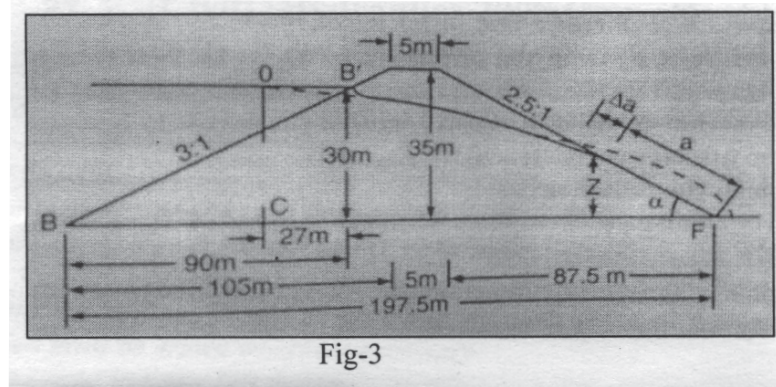


Fig-2

OR



- Q6)** a) Calculate the seepage per meter length through the body of the dam section shown in fig-3. Assume coefficient of permeability  $K = 8 \times 10^{-4}$  cm/sec. [8]



- b) Draw a cross-section of an earth dam with the following data : [8]  
 R. L. of natural surface at site = 100.00 m  
 R. L. of F. R. L. = 118.30 m  
 R. L. of H. F. L. = 121.30 m    Slope of saturation line 4:1. Assume other data.

### SECTION - II

- Q7)** a) Explain the various types of rockfill dams and draw the sketches for each of them. [10]  
 b) What are the various methods of construction of rockfill dams? Explain any one in detail. [8]
- OR
- Q8)** a) Explain the concept and design of Buttress dam. Also discuss the merits and demerits of buttress dam over gravity dam. [10]  
 b) Draw plan and an elevation of a flat slab deck type buttress dam and describe the important features of the same. [8]
- Q9)** a) Design an Ogee shape gated spillway for the following data : [10]  
 i) Maximum design flood = 1200 cumec.  
 ii) Average river bed level = 0 m.  
 iii) R.L. of crest of spillway = 101.00 m.  
 iv) Slope of crest of spillway = 0.7H : 1V.  
 v) Width of pier = 2.0 m  
 vi) Maximum allowable water level during flood = 105.00 m  
 Assume number of span as 7, clear way of each span as 10.0 m and  $k_a = 0.1$ ,  $K_p = 0.01$ .

- b) Explain energy dissipation arrangement for the following two cases:[6]  
i) T. W. C. coincides H. J. C.  
ii) T. W. C. always above H. J. C.

OR

- Q10)** a) Describe Indian Standard practice for design of horizontal apron stilling basin for a dam spillway. [8]  
b) Describe the Creager's method of designing profile of a overflow spillway. [8]

- Q11)** a) Explain with neat sketches : [8]  
i) Remiolds automatic gate  
ii) Visvesvaraiya's gate  
b) What are the advantages of gated spillway. [8]

OR

- Q12)** a) Explain with neat sketches : [8]  
i) Drum gate  
ii) Stoney gate  
b) What are sluices? What functions they serve? Describe Dharwar and Belgam type briefly with the help of sketches. [8]



Total No. of Questions : 8]

SEAT No. :

P4065

[Total No. of Pages : 2

[4860]-230

M.E. (I.T.)

**HIGH PERFORMANCE COMPUTER NETWORKS  
(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** For a college the following scenario is given for development : **[16]**

Number of Machines : 400

Number of Laboratories: 10 (40 machines per laboratory),

Number of buildings: 2 (5 laboratories per building and laboratories are located in 3 different floors)

Number of servers: 3

Suggest high performance computer network for above task. Internet facility should be given to all the machines. Recommend internet lease line capacity.

Justify your design with proper specifications.

**Q2)** a) Give and explain standards of gigabit Ethernet with relevant application. **[16]**

b) Explain Architecture of Broadband Network.

**Q3)** a) What are ISDN Interface, Functions and Services?

b) Explain B-ISDN.

**[16]**

**P.T.O.**

- Q4)** Solve Any Three : **[18]**
- a) SRP Protocol and Authentication.
  - b) QoS in HPCN.
  - c) ATM Service Categories.
  - d) Queuing System.

**SECTION - II**

- Q5)** a) Explain DMT with neat block diagram.  
b) Compare different techniques of DSL technologies. **[16]**

- Q6)** a) Explain Gigabit Capable Passive Optical Networks (GPON).  
b) Explain SONET with layered Architecture. **[16]**

- Q7)** a) Explain 3G technologies along with their applications.  
b) Explain the significance of Mobile IP. **[16]**

- Q8)** Solve Any Three : **[18]**
- a) DWDM.
  - b) UMTS.
  - c) GSM Architecture.
  - d) Fiber Channel Protocol Architecture.



Total No. of Questions : 8]

SEAT No. :

P4637

[Total No. of Pages : 3

[4860]-231

M.E. (E & TC.) (Signal Processing)

LINEAR ALGEBRA & RANDOM PROCESSES

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from each section.
- 2) Answers to the two sections should be written in sparate books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of logorithmic tables slide rule, mollier charts, electronic pocket calculater and steam tables is allowed.
- 5) Assume Suitable data, if necessary.

**SECTION - I**

**Q1)** a) Find 2 non- singular matrices P & Q such that PAQ is in the normal form

where,  $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & -1 \\ 3 & 1 & 1 \end{bmatrix}$  Also find rank of the matrix. [8]

b) If A be any square matrix, then show that  $A + A'$  is symmetric and  $A - A'$  is skew symmetric [4]

c) Find inverse of the matrix.  $\begin{bmatrix} 1 & -2 & -1 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$  [6]

**Q2)** a) Obtain the characteristic equation of the matrix  $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$

and verify that it satisfies Cayley Hamilton theorem and hence find its inverse. [8]

P.T.O.

b) Prove the following.

$$A = \begin{bmatrix} -1 & 0 & 0 & a \\ 0 & -1 & 0 & b \\ 0 & 0 & -1 & c \\ x & y & z & -1 \end{bmatrix} = 1 - ax - by - cz. \quad [8]$$

**Q3)** a) Prove that rank of product of 2 matrices cannot exceed rank of either of matrix. [8]

b) Determine the characteristic roots and the corresponding characteristic vectors of the matrix.

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix} \quad [8]$$

**Q4)** a) Show that the equations  $x + y + z = 6$ ,  $x + 2y + 3z = 14$ ,  $x + 4y + 7z = 30$  are consistent and solve them. [8]

b) Prove that triangular matrix is normal, if and only if, it is a diagonal matrix. [8]

### SECTION - II

**Q5)** a) Define probability, CDF and PDF. List the properties of all the three. [10]

b) Number of telephone calls arriving at a switch board during any 10 minutes period is known to be Poisson. Distributed with  $\lambda = 2$ . Determine the probability that more than 3 calls will arrive during any 10 minutes period. [8]

**Q6)** a) Two random variables X & Y are related by the relation  $y = ax + b$  where a & b are real constants. Show that covariance between two variables is given by.

$$\sigma_{xy} = a\sigma^2x. \quad [8]$$

b) Explain autocorrelation & autocovariance for a random process. [8]

**Q7)** a) Explain Binomial and Exponential distribution functions. Give an example for each. [8]

b) Distinguish between. Ensemble, Ensemble average and time average. [8]

**Q8)** a) Find the mean and variance of poisson distribution. [8]

b) Sketch the power spectral density, autocorrelation and probability density function for white Gaussian noise. What is noise B.W.? [8]



Total No. of Questions : 8]

SEAT No :

P4510

[4860] - 233

[Total No. of Pages : 3

**M.E. (E & TC) (Signal Processing)**  
**SIGNAL PROCESSING TECHNIQUES**  
**(2008 Pattern) (504502) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer to the two sections should be written in separate Answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** Given the sequences as **[8]**

$$x_1(n) = \{1,3,5,3\} \quad x_2(n) = \{2,3,1,1\}$$

Determine Linear convolution of  $x_1(n)$  and  $x_2(n)$  using circular convolution. What is use of circular convolution property of DFT? Explain in detail.

b) The desired frequency response of a low-pass filter is given , Length=7 **[8]**

$$H_d(e^{j\omega}) = \begin{cases} e^{-j\omega(3)} & -\frac{3\pi}{4} \leq \omega \leq \frac{3\pi}{4} \\ 0 & \frac{3\pi}{4} < \omega \leq \pi \end{cases}$$

Design FIR filter using rectangular window.

**Q2) a)** Explain the Kaiser window used for FIR filter design, with its frequency response. **[6]**

b) It is required to design a digital filter with cut-off frequency of  $0.25\pi$  rad/samples. From analog filter having the following response. **[4]**

$$H(s) = \frac{\Omega_c}{s + \Omega_c}$$

Using bilinear transformation method.

**P.T.O.**



- c) Find the order and cut off frequency of a digital filter with the following specifications. [8]

$$0.89 \leq |H(e^{j\omega})| \leq 1 \quad 0 \leq \omega \leq 0.4\pi$$

$$|H(e^{j\omega})| \leq 0.18 \quad 0.6\pi \leq \omega \leq \pi$$

Using impulse invariance method. Also find the poles of the filters.  
( $T_{\text{sampling}} = 1 \text{ sec}$ ).

- Q3)** a) A 8 point DT sequence is given by  $x(n) = \{1, 2, 2, 1, 0, 0, 0, 0\}$ . Find the corresponding DFT using DITFFT. [8]

- b) Find the Inverse z - Transform of the [8]

$$X(z) = \frac{5z}{(z-1)(z-2)}$$

In case -

- i) For stable
- ii) Causal
- iii) Non-causal.

- Q4)** a) Find the transfer function and unit step sample response of the 2nd order difference equation with zero initial condition. [8]

$$y(n] = x(n) - 0.25 y(n - 2)$$

- b) What is aliasing in sampling? Explain with spectrum, how to minimize aliasing effect. [8]

### SECTION - II

- Q5)** a) A discrete time LTI system is [8]

$$y(n] = \frac{3}{4} y(n - 1) - \frac{1}{8} y(n - 2) + x(n) + \frac{1}{3} x(n - 1)$$

Obtain cascade realisation of the same. Where  $x$  is input &  $y(n)$  is output of the system. Also compare structure with Direct form.

- b) Perform Linear convolution of the following sequences by overlap - save method. [8]

$$x(n) = \{1,2,3,4,2,3,3,4\}$$

$$h(n) = \{-1, 1\}$$

- Q6)** a) Determine z - transform and their ROC of the following discrete time signals [8]

i)  $x(n) = (0.8)^n u(-n-1)$

ii)  $x(n) = n^3 u(n)$

- b) Draw the signal Flow graph for the DIF - FFT in case of 8-point. [6]  
c) Compare FIR and IIR filter w.r.t. Phase stability and recursion with example. [4]

- Q7)** a) State and verify correlation and convolution property of z- Transform.[8]

- b) Design ideal FIR filter using frequency sampling method for a given specifications . [8]

Length of filter = 7

Low pass filter with cut-off  $\frac{2\pi}{3}$  rad/samples.

- Q8)** a) Given sequence  $x(n) = \{4,3,2,5\}$ . Using property of DFT find the DFT of  $x(n-2)$ . [6]

- b) What is frequency warping in case of IIR filter? Explain. [2]

- c) Explain about the stability and mapping formula for approximation of derivatives method in case of IIR filter. [8]



Total No. of Questions : 8]

SEAT No. :

**P4066**

**[4860] - 234**

[Total No. of Pages : 3

**B.E. (Electronics and Telecommunications) (Signal Processing)**

**DIGITAL IMAGE PROCESSING**

**(2008 Pattern) (Elective - I (a))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer to both sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** Define histogram of an image. Explain histogram equalization technique for contrast enhancement of images. **[8]**

b) The image segment is as shown below. **[8]**

i) Let  $V = \{0,1\}$  and compute the lengths of the shortest 4, 8, and m-path between pixels p and q. If a particular path does not exist between these two points, explain why?

ii) Repeat for  $V = \{1, 2\}$ .

3 1 2 1 (q)

2 2 0 2

1 2 1 1

(p) 1 0 1 2

**Q2) a)** Explain the design of Laplacian mask? Comment on the performance of the Laplacian? What do you mean by Unsharp masking and High boost filtering? What are applications of high boost filtering? **[10]**

b) Explain how the forward and inverse 2D Discrete Fourier Transform (DFT) is computed? Explain following properties with respect to 2D DFT **[8]**

i) Translation

ii) Rotation

iii) Scaling

iv) Seperability

Explain how seperability property is used in filtering in frequency domain.

**P.T.O.**

**Q3) a)** What is image segmentation? What are the different approaches of image segmentation? Explain different edge detection approaches used in segmentation. [8]

b) Explain in detail region splitting and merging technique used in image segmentation. [8]

**Q4) a)** Explain the algorithm for detecting threshold automatically in basic thresholding technique used in image segmentation. [8]

b) Find the Discrete Cosine Transform of the 2x2 image [8]

$$I = \begin{pmatrix} 4 & 2 \\ 2 & 1 \end{pmatrix}$$

## **SECTION - II**

**Q5) a)** With the help of suitable block diagram explain the process of image encoding and decoding in JPEG image compression standard. [10]

b) Explain the following with respect to compression [8]

i) Compression ratio.

ii) Coding redundancy.

iii) Interpixel redundancy.

iv) Psycho-visual redundancy.

Explain any one objective and subjective quality measure to determine quality of decompressed image.

**Q6) a)** What is image restoration? What is the difference between image restoration and image enhancement? Explain with block diagram the image degradation/ restoration process model. [8]

b) What the different techniques used to estimate the degradation models in image restoration? [8]

- Q7)** a) Explain how inverse filtering is used in image restoration. [8]  
b) Explain an additive and subtractive color models. What are the applications of these models? [8]
- Q8)** a) Explain KL transform in detail. What are the application of KL transform.[8]  
b) Write a short note on order statistic filters used in image enhancement.[8]



Total No. of Questions : 8]

SEAT No. :

**P4067**

**[4860] - 236**

[Total No. of Pages : 2

**M.E. (Electronics and Telecommunications) Signal Processing  
ARTIFICIAL INTELLIGENCE  
(2008 Pattern) (Elective - I )**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answer to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Discuss various issues in knowledge representation. Also discuss the methods use for knowledge representation. **[18]**

**Q2)** Discuss various issues in the design of search programs. Describe any two methods of heuristic search techniques. **[16]**

**Q3)** Explain Agent-oriented problem solving in detail. What are the applications of an Agent oriented paradigm. **[16]**

**Q4)** Explain components of planning system. Explain any two types of planning techniques. **[16]**

**SECTION - II**

**Q5)** Explain Bayes theorem and its role in statistical reasoning with proper example. **[18]**

**Q6)** Explain - supervised, unsupervised and reinforcement learning with examples **[16]**

**P.T.O.**

**Q7)** Compare advantages & disadvantages of Neural networks, Fuzzy logic and genetic algorithms. **[16]**

**Q8)** How do the topics of knowledge representation and problem solving techniques interact with each other? Give examples. **[16]**



Total No. of Questions : 10]

SEAT No. :

**P4068**

[4860] - 237

[Total No. of Pages : 2

**M.E. (E & TC) (Signal Processing)**  
**BIOMEDICAL SIGNAL PROCESSING**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) State the requirements for a typical biomedical measurement system. [9]  
b) State in a tabular form any 10 medical and physiological parameters mentioning the principal of measurement, range of parameter, signal frequency and sensor type. [9]
- Q2)** a) Explain the structure of a nerve cell and muscle cell with a neat figures.[8]  
b) Explain action potential and clearly state the role of Na-K pump during the entire phase. [8]
- Q3)** a) Compare and contrast invasive and non-invasive bio- electrodes with proper examples. [8]  
b) Explain the working principle of resistive sensors and state their possible applications for measuring physiological parameters. [8]
- Q4)** a) Explain the cardiovascular system in terms of a hydraulic system. [8]  
b) Explain the Goldberg Leads system for acquiring ECG? What are its advantages? [8]

**P.T.O.**



- Q5)** a) Explain the phonocardiogram signals and its use in medical diagnostics. [8]  
b) State and explain the back-projection concept used in a Computerized Tomography. [8]

**SECTION - II**

- Q6)** a) Explain the susceptibility factors with reference to patient safety? [8]  
b) Design an active 4<sup>th</sup> order LPF with a lower cut-off frequency of 200Hz. The pass-band gain is desired to be constant. Justify the filter topology used and mention the specification requirements of the components used. [8]

- Q7)** a) What is a medical isolation amplifier? State the specifications of a typical isolation amplifier. [8]  
b) State the windowing techniques used in digital signal processing for biomedical signals. [8]

- Q8)** a) Explain the spectrogram technique for bio-signal processing. [8]  
b) Explain the types of noise models in bio-signal analysis. [8]

- Q9)** Explain any four applications of wavelet decomposition for bio-signal analysis with suitable examples. [16]

- Q10)** Write notes on (any two) : [18]

- a) Biostatistics  
b) X-ray Imaging  
c) Artificial neural networks for bio-medical application



Total No. of Questions : 8]

SEAT No. :

**P4069**

**[4860] - 238**

[Total No. of Pages : 3

**M.E. (E & TC) (Signal Processing)**  
**WIRELESS AND MOBILE COMMUNICATION**  
**(2008 Pattern) (Elective - II (b))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Black figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** Draw the block diagram of a Cellular Mobile Communication system.[8]

Explain why a hexagon has been chosen to represent a cell in Cellular layouts, even though most of the cells are not hexagonal in shape?

b) During a Busy Hour, the number of calls per hour for each of the 12 cells of a cellular cluster is 2200, 1900, 4000, 1100, 1000, 1200, 1800, 2100, 2000, 1580, 1800 & 900. Assuming that 75 % of the mobile phones in this cluster are used and during this period one call is made per phone.[8]

- i) Calculate the following:
- ii) Number of Customers in the system,
- iii) Assuming an average holding time of 60 seconds, what is the traffic in the cluster in Erlangs?
- iv) Find the reuse distance if  $R= 5$  Kms.

**Q2) a)** Explain the use of two wave model to explain Mobile Radio Path Loss and Antenna Height Effects? Show that the power received is given by  $P_r = [h_1 h_2 / d]^2$ , where  $h_1$  and  $h_2$  are the heights of the transmitting antenna and mobile antenna respectively and 'd' is the distance between them.[8]

**P.T.O.**

- b) What are the consequences of choosing: [8]
- i) A large Cell Reuse Pattern (Cluster Size) and
  - ii) Small Cell Reuse Pattern (Cluster) on the following parameters :
    - a) Spectrum Utilization Efficiency,
    - b) Carrier to Interference Ratio,
    - c) No. of calls per cell,
    - d) No. of channels available per cell.

**Q3) a)** Explain what role the following factors play in while attempting to predict the propagation path loss for a particular mobile radio environment? [8]

- i) Radio Horizon,
- ii) Sky Reflections
- iii) Mobile Antenna Height,
- iv) Effect of Surface Waves.

b) How many users can be supported for 0.5 % Blocking Probability for the following number of trunked channels in a blocked calls cleared system? [8]

- (i) 1, (ii) 5, (iii) 10, (iv) 20, (v) 100.

Assume that each user generated 0.1 E of traffic.

**Q4) a)** Explain in detail the following effects encountered in Cellular Mobile Communication [8]

- i) Long Term Fading,
- ii) Short Term Fading,
- iii) Delay Spread,
- vi) Coherence Bandwidth.

b) What is the need for equalization in a receiver? Also explain the linear equalizer in detail. [4]

c) Explain in brief, the Trellis Coded Modulation concept and Turbo Codes along with its application [6]

## SECTION - II

- Q5)** a) Explain “Antenna Pattern Ripple Effect” [8]
- b) In a mobile radio environment, the average cell site antenna height is 50 m, the mobile antenna height is 3 m, and the communication path length is 5 km. Calculate the following: [8]
- i) Incident angle,
  - ii) The elevation angle at the antenna of the mobile unit,
  - iii) The elevation angle at the location of the mobile unit.
- Q6)** a) Name the main elements of GSM system architecture and describe their functions. What are the advantages of specifying not only the radio interface but also all internal interfaces of the GSM system? [10]
- b) Why are so many different identifiers/addresses needed in GSM? [8]
- Distinguish between user related and system related identifiers.
- Q7)** a) With neat diagram explain the forward CDMA channel modulation process. What is the role of Walsh codes in it? [10]
- b) The IS-95 system uses a rate 1/2 convolutional encoding in the forward channel and a rate 1/3 convolutional coding in the reverse channel. What were the reasons for doing so? [6]
- Q8)** a) What is the basic pre-requisite for applying FDMA? How does this factor increase complexity compared to TDMA systems? [8]
- b) What is the main physical reason for the failure of many MAC schemes used successfully in wired networks and wireless networks? [8]



Total No. of Questions : 8]

SEAT No. :

P4453

[4860] - 24

[Total No. of Pages : 3

**M.E. (Civil) (Hydraulic Engineering)**  
**c-SYSTEM TECHNIQUES IN WATER RESOURCES ENGINEERING**  
**(Semester - I) (2008 Course) (501304) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** Solve the following LPP using Simplex method: **[10]**

$$\text{Maximize, } Z = 3x_1 + 2x_2$$

$$\text{Subject to, } -x_1 + 2x_2 \leq 4$$

$$3x_1 + 2x_2 \leq 14$$

$$x_1 - x_2 \leq 3$$

$$x_1 \geq 0; x_2 \geq 0$$

**b)** Write the dual of the following primal LP problem: **[6]**

$$\text{Maximize, } Z = x_1 + 2x_2 + x_3$$

$$\text{Subject to, } 2x_1 + x_2 - x_3 \leq 2$$

$$-2x_1 + x_2 - 5x_3 \geq -6$$

$$4x_1 + x_2 + x_3 \leq 6$$

$$x_1, x_2, x_3 \geq 0.$$

**Q2) a)** Use Golden section search method to **[8]**

$$\text{Minimize, } f(x) = x^4 - 15x^3 + 72x^2 - 1135x;$$

Terminate the search five iterations.

The initial range of 'X' is  $1 \leq X \leq 15$ .

**P.T.O.**

- b) Using Lagrangian Function, [8]  
 Maximize:  $f(x) = 3x_1^2 + x_2^2 + 2x_1x_2 + 6x_1 + 2x_2$   
 Subject to,  $2x_1 - x_2 = 4$

- Q3)** a) Define: [8]
- i) Unimodal Function.
  - ii) Multimodal Function.
  - iii) Saddle Point.
  - iv) Continuous Function.
  - v) Discontinuous Function.
  - vi) Concave Function.
  - vii) Convex Function.
  - viii) Linear Function.
- b) Discuss multistage decision process in dynamic programming with engineering application. [8]

- Q4)** Write short notes on (any three): [18]
- a) System approach in hydraulic engineering.
  - b) Linear programming application to reservoir operation problem.
  - c) Kuhn. Tucker's conditions.
  - d) Fibonacci; univariate search technique.

### SECTION - II

- Q5)** a) Discuss the practical rules that can be applied to recognize, whether, arrivals/departures follow a Poisson process. Using the following data for a process, apply practical rules and state the distribution it follows: [8]

No. of arrivals per hour ( $n$ )	0	1	2	3	4	5	6
Frequency ( $f_n$ )	10	31	40	20	10	4	6

- b) What are the types of simulation? Discuss any application in hydraulic engineering/water resources engineering. [8]

- Q6)** a) What is game? Write the properties; the game situation should follow. Also discuss types of games. [8]
- b) Using the principle of dominance, solve the following game: [8]

		Player B		
		3	-2	4
Player A	[	3	-2	4
	-	1	4	2
	]	2	2	6

- Q7)** a) Define posynomial. State whether each of the following function is a polynomial or posynomial or both: [6]
- i)  $f = 4 - x_1^2 + 6x_1x_2 + 3x_2^2$
- ii)  $f = 4 + 2x_1^2 + 5x_1x_2 + x_2^2$
- b) There are five jobs each of which must go through the two machines 'A' and 'B' in the order 'AB'. Processing times are as given below: [10]

Job	1	2	3	4	5
Machine 'A'	5	1	9	3	10
Machine 'B'	2	6	7	8	4

Determine the sequence for five jobs that will minimize the total elapsed time. What is machine idle time.

- Q8)** Write short notes on (any three): [18]
- a) Benefit cost analysis: Direct and Indirect benefits, social benefit cost approach.
- b) Discounting Techniques to check feasibility of engineering projects.
- c) Arithmetic - geometric inequality.
- d) Conditions of project optimality in reference to water resources problems.



Total No. of Questions :8]

SEAT No. :

**P4511**

**[4860]-240**

[Total No. of Pages :2

**M.E. (E&TC) (Signal Processing)**  
**STATISTICAL SIGNAL PROCESSING**  
**(2008 Course) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION -I**

- Q1)** a) Explain FIR least squares inverse filters with application. [6]
- b) Given a signal where first six values are  $X = [1, 1.5, 0.75, 0.375, 0.1875, 0.0938]$  are the pade's approximation to find second order all pole model ( $P=2, q=0$ ) [6]
- c) What is least square method of signal modelling explain in detail. [6]
- Q2)** a) State & explain Prony's method of signal modelling in detail. Also derive the expression for the minimum error. [8]
- b) Auto correlation values are given as,  $r_x(0) = 26, r_x(1) = 7, r_x(2) = 7/2$ , use Yule - Walker eq<sup>n</sup> & develop ARMA(1,1) model for random process  $x(n)$ . [8]
- Q3)** a) State & explain Levinson Durbin algorithm. This algorithm can be modified as step-up recursion. Justify. [8]
- b) Given the autocorrelation sequence  $r_x(0) = 1, r_x(1) = 0.8, r_x(2) = 0.5$  &  $r_x(3) = 0.1$  use Levinson Durbin recursion to [8]
- i) Find reflection coefficient.
  - ii) The model parameters  $a_p(k)^{y_j}$ .
  - iii) The modeling error  $\epsilon_j$  for  $j = 1, 2, 3$ .

**P.T.O.**



- Q4)** a) Explain in detail AR, MA & ARMA process. [8]
- b) Consider a first order AR process that is generated by the difference equation [8]
- $$y(n) = ay(n-1) + w(n) \text{ where, } |a| < 1 \text{ \& } w(n) \text{ is a zero mean white noise random process with variance } \sigma^2 w.$$
- i) Find the unit sample response of the filter that generate  $y(n)$  from  $w(n)$ .
- ii) Find autocorrelation of  $y(n)$ .
- iii) Find power spectrum of  $y(n)$ .

### SECTION -II

- Q5)** a) Explain MYWE method for modeling an AR(P) process. [8]
- b) Explain how FIR Wiener filter can be used for filtering & prediction. [8]
- Q6)** a) Write a note on minimum variance spectrum estimation in detail. [8]
- b) Bartlett method is used to estimate the power spectrum of signal from sequence  $x(n)$ , consisting of  $N = 2400$  samples. [8]
- i) Determine the smallest length 'L' of each segment in Bartlett method that yields frequency resolution of  $\Delta f = 0.1$ .
- ii) Repeat part (i) for  $\Delta f = 0.02$ .
- iii) Determine the quality factors 'Q' for parts (i) & (ii).
- Q7)** a) Explain difference between parametric & non parametric method with advantage & disadvantages. [8]
- b) Justify why periodogram method is asymptotically unbiased but not a consistent estimation. [5]
- c) Explain how DFT can be used to find power spectrum estimation. [5]
- Q8)** a) For causal FIR Wiener filter derive Wiener Hope equation & minimum error. [8]
- b) Compare periodogram, modified periodogram, Bartlett & Welch method. [8]

*EEE*

Total No. of Questions : 8]

SEAT No. :

**P4070**

**[4860] - 241**

[Total No. of Pages : 2

**M.E. (Electronics & Telecommunication - Signal Processing)**

**ADVANCED DIGITAL SIGNAL PROCESSING**

**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the both sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Write down Up sampler and down sampler properties. [8]
- b) Draw a block schematic for a decimator and explain the need for a filter? How is aliasing avoided, derive output equation. Draw the spectrum of the signal after filtering and after the decimation process. [10]
- Q2)** a) A signal with a sampling frequency of 3072 kHz is to be decimated by a factor of 3 to get a new sampling frequency of 48 kHz. The signal band of interest extends from 0 to 20 kHz. The pass band deviation is 0.01dB and the stop band attenuation is 80dB. Design 3- stage filter. [8]
- b) What are the characteristics of polyphase filters? Draw the polyphase interpolator filter structure with  $I=3$ . Also draw polyphase decimator structure. How are the polyphase structures efficient? [8]
- Q3)** a) Explain applications of Adaptive filters. [8]
- b) Explain the use of Least Square Method for system modeling. [8]
- Q4)** a) Write short notes on shank method. [8]
- b) Explain the concept of decimation for image resizing. [8]

**P.T.O.**

## SECTION - II

- Q5)** a) Draw second order Lattice filter for FIR filter realization. Write the equation for output of filter. Find the relation between predictor coefficients and reflection coefficients. [10]
- b) Draw and explain delay and sum beam former. [8]
- Q6)** a) Describe the direct form FIR filter realization. [8]
- b) Explain Levinson and Durbin algorithm to determine the autoregressive parameters of linear predictive filter. [8]
- Q7)** a) Discuss the features of TMS 320C54xx in detail. [8]
- b) Explain widrow LMS algorithm. [8]
- Q8)** a) Draw super Harvard architecture and explain how it is useful for MAC instructions. [8]
- b) Describe the applications of Multi rate DSP. [8]



Total No. of Questions : 8]

SEAT No. :

**P4071**

**[4860] - 242**

[Total No. of Pages : 2

**M.E. (E & TC) (Signal Processing)  
VLSI IN SIGNAL PROCESSING  
(2008 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections must be written in separate sheets.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of logarithmic tables and electronic pocket calculator is allowed.*

**SECTION - I**

- Q1)** a) Explain need of vector quantization. Also explain encoding & decoding process with tree structured vector quantization. [8]  
b) Explain Loop bound and iteration bound and their computation. [8]
- Q2)** a) Explain with the example, the algorithm to retime DFG for clock period minimization. [8]  
b) Explain properties of Retiming. [8]
- Q3)** a) Explain mathematically how pipelining can achieve low power. [8]  
b) Explain the properties of Unfolding. [8]
- Q4)** Write short note on of the following. [18]  
a) List the Retiming techniques & explain cut set retiming  
b) Parallel processing and pipelining architecture  
c) Design B2 for FIR systolic arrays

**P.T.O.**

## SECTION - II

- Q5)** a) Explain parallel multipliers with modified Booth recoding. [8]  
b) Explain the Parallel Carry Save and Carry Ripple Array multipliers with sign bit extensions. Draw Dependence Graph for each. [8]
- Q6)** a) With the help of neat diagrams explain the IO block, CLB slices and block memory of any FPGA. [10]  
b) Describe various clock distribution strategies for SoC designs. Explain in brief the merits and demerits of each. [8]
- Q7)** a) Explain floor planning used for FPGA. [8]  
b) Explain with neat diagram Booth Wallace Tree multiplier. [8]
- Q8)** Write short note on any two of the following. [16]  
a) Features available on latest FPGA.  
b) FIR filters implementation on FPGA.  
c) Clock managers.



Total No. of Questions : 8]

SEAT No. :

**P4072**

**[4860] - 243**

[Total No. of Pages : 3

**M.E. (Electronics and Telecommunications) (Signal Processing)  
ACOUSTICS & SPEECH PROCESSING  
(2008 Pattern) (Elective - III (a)) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain different methods of microphone calibration. [8]  
b) Explain the following terms [8]  
i) Sound pressure  
ii) Sound particle displacement  
iii) Sound velocity  
iv) Sound intensity
- Q2)** a) Explain the SISO and MIMO modes. [8]  
b) Discuss the following acoustical design criteria for rooms. [8]  
i) Direct sound  
ii) Reverberation  
iii) Lateral reflections  
iv) Diffusivity
- Q3)** a) How to measure the acoustic impulse response? [8]  
b) Explain the problem of acoustic reverberation with respect to absorption coefficients of common building material like - plaster, brick wall, draperies, floor, glass, wood pane ling, glazed tiles, rock wool etc. [8]

***P.T.O.***

**Q4)** Write short notes on : **[18]**

- a) Audio mixer
- b) Characteristics of acoustic channels
- c) Graphic equalizers

**SECTION - II**

**Q5)** a) Explain with applications, the short time features used in speech processing. **[8]**

b) Explain the digital model of speech production system. **[8]**

**Q6)** a) What do you mean by cepstrum? Explain the use of cepstrum in speech analysis. **[8]**

b) Explain the human speech perception system and its filterbank modeling. **[8]**

**Q7)** a) Probabilities of tomorrow's weather based on today's weather are given in the table below. **[8]**

Today's Weather	Tomorrow's weather		
		Sunny	Rainy
Sunny	0.8	0.05	0.15
Rainy	0.2	0.6	0.2
Foggy	0.2	0.3	0.5

If today is Sunny, what is the probability that tomorrow is Sunny and day after is rainy?

b) Explain the following Implementation issues of HMM **[8]**

- i) Model structure and size
- ii) Training with insufficient data

**Q8)** Write short notes on :

**[18]**

- a) Physiology of speech production
- b) MFCC feature extraction
- c) Pitch period estimation





Total No. of Questions : 8]

SEAT No. :

**P4073**

**[4860] - 244**

[Total No. of Pages : 2

**M.E. (E & TC) (Signal Processing) (Semester - II)**

**DIGITAL SIGNAL COMPRESSION**

**(2008 Pattern) (Elective - III)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain Arithmetic coding procedure? Explain with code. [8]  
b) Explain an algorithm to generate bit stream using SPIHT Coder with the help of example [10]
- Q2)** a) Give a comparison between lossless and lossy data compression techniques. [8]  
b) Consider a source with symbol probabilities  $P(a_1) = 0.7$ ,  $P(a_2) = 0.05$  and  $P(a_3) = 0.25$ . Find the tag using arithmetic coding for a sequence  $a_1, a_3, a_2$ [8]
- Q3)** a) Explain Jayant's quantizer with the help of neat block diagram. [8]  
b) Explain rate distortion theory? How it minimizes distortion? [8]
- Q4)** a) What is Linear Predictive Coding (LPC)? How LPC is used in speech Coding? [8]  
b) Explain the effect of variance mismatch on the performance of a uniform quantizer. Plot SNR Vs. ratio of input to design variance. [8]

**P.T.O.**

## SECTION - II

- Q5)** a) What is adaptive quantization? How step size will adaptively change by tracking the statistics of signal? How to select optimal delta? [8]  
b) Explain JPEG2000 standard in details and list the important features of it.[8]
- Q6)** a) What is streaming Audio? How it is achieved? [8]  
b) Explain how to decide the transmission rate if the tolerable distortion is given. [8]
- Q7)** a) What is wavelet? Explain any one method of wavelet decomposition.[8]  
Explain meaning of perfect reconstruction filter.  
b) What is companding? Why companding is must for speech signal. [8]  
Explain A-law and  $\mu$ -law.
- Q8)** Explain block based motion estimation and motion compensation technique.  
What are the advantages of block based motion compensation. [18]



Total No. of Questions : 8]

SEAT No. :

**P4074**

**[4860] - 245**

[Total No. of Pages : 2

**M.E. (E & TC) (Signal Processing) (Semester - II)**

**MULTIMEDIA TECHNIQUES**

**(2008 Pattern) (Elective - III (c))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** Explain different types of scanners. **[8]**

b) Explain the salient features of a typical scanning software. **[8]**

**Q2) a)** Explain features of a typical video editing software. **[8]**

b) Explain different Audio file formats. **[8]**

**Q3) a)** What are different building blocks of Multimedia? **[8]**

b) What are different Multimedia applications? **[8]**

**Q4)** Write short notes on any three: **[18]**

- a) Steps in creating 3D animation.
- b) Working of Digital camera
- c) JPEG compression standard for video.
- d) Line-drawing algorithm and circle-drawing algorithm.

**P.T.O.**

## SECTION - II

- Q5)** a) What are MIDI messages? [8]  
b) With the help of suitable block diagram, explain JPEG compression standard for video. [8]
- Q6)** a) Explain different Text compression methods. [8]  
b) Explain with suitable examples, lossy and lossless compression techniques. [8]
- Q7)** a) An NTSC encoded video clip has a frame size of 720 x 480 pixels & is digitizing using a bit-depth of 8 bits for each Y, Cb & Cr & a chroma sub-sampling scheme of 4:2:2. Calculate the file size of a 10 sec. video clip & total time taken for it to be transmitted over a 2 Mbps transmission line. [8]  
b) Explain different types of Animation. [8]
- Q8)** Write short notes on any three: [18]  
a) Virtual reality  
b) Explain salient features of a typical audio editing software  
c) Different standards used for colour TV transmission and reception  
d) Multimedia authoring tools



Total No. of Questions : 8]

SEAT No. :

**P4075**

**[4860] - 246**

[Total No. of Pages : 2

**M.E. (E & TC) (Signal Processing) (Semester - II)**  
**RADAR & SATELLITE SIGNAL PROCESSING**  
**(2008 Pattern) (Elective - IV)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Q. 1 & Q. 5 are compulsory.*
- 2) *Solve any two questions from Q. 2, Q. 3 & Q. 4 for Section I.*
- 3) *Solve any two questions from Q. 6, Q. 7 & Q. 8 for Section II.*
- 4) *Answers to the two sections must be written in separate sheets.*
- 5) *Neat diagrams must be drawn wherever necessary.*
- 6) *Figures to the right indicate full marks.*
- 7) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the basic principles of a radar system with neat block diagram. Give the limitations and applications of radars. [8]
- b) Derive the radar range equation? Explain the factors that affect the maximum range of radar. [6]
- c) Explain the concept of Doppler effect associated with moving targets with mathematical relevance. [4]
- Q2)** a) Explain with neat block diagram the working principle of military radar system. Also discuss the various additional features available in military radars. [8]
- b) Explain with neat block diagram the working principle of Moving Target Indicator (MTI) radar. [8]
- Q3)** a) Discuss various types of antennas used for RADAR applications. Also discuss the polarization for the antennas used. [6]
- b) Explain the concept of "Pulse Compression". [6]
- c) Differentiate between Continuous Wave & Pulsed radar systems. [4]

**P.T.O.**

- Q4)** Write short notes on: [16]
- a) Frequency Diversity radar
  - b) Blind Speeds
  - c) Radar Clutters
  - d) Radar Beacons

**SECTION - II**

- Q5)** a) With respect to satellite communication explain the following: [8]
- i) Apogee and Perigee
  - ii) Mean and True anomaly
- b) What is a geostationary orbit? Which conditions should be fulfilled to attain a geostationary orbit? Also List the advantages and disadvantages of GEO satellites. [10]

- Q6)** a) Comment on various interferences and noise sources in satellite communication system. [6]
- b) List and discuss the various orbits defined for satellite communication. [6]
- c) Enlist the advantages and limitations for the satellite communication systems. [4]

- Q7)** a) With neat block diagram explain QPSK encoder & decoder with relevant waveforms. [8]
- b) Explain the concept of Packet Radio also discuss the packet oriented protocols. [8]

- Q8)** Write short notes on: [16]
- a) Orbital Perturbations
  - b) Antennas used in Satellite Communication
  - c) Argument of Perigee
  - d) Reciprocity theorem used for Antenna



Total No. of Questions : 8]

SEAT No. :

**P4076**

[Total No. of Pages : 2

**[4860] - 247**

**M.E. (E & TC - Signal Processing)**

**OPERATING SYSTEMS AND OPEN SOURCE SYSTEMS**

**(2008 Pattern) (Elective - IV)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates :-*

- 1) Answer any 3 (three) questions from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams must be drawn wherever necessary.*
- 5) Assume suitable data, if required.*

**SECTION - I**

- Q1)** a) Explain multiprogramming, timesharing, realtime and distributed OS with examples. [8]
- b) Draw and explain the process control block. Write the difference between process and thread. [8]
- Q2)** a) Explain in brief preemptive and non-premptive scheduling algorithms. List the scheduling algorithms and explain any 1 with example. [8]
- b) Explain the any two classical IPC Problems. [8]
- Q3)** a) Explain in brief memory management techniques paging and segmentation. Explain internal and external fragmentation. [8]
- b) Explain 2 types of threads. Explain multithreading models. [8]

***P.T.O.***

**Q4) Write Short notes on:** **[18]**

- a) Deadlock prevention and avoidance.
- b) Critical Section Problem and semaphores.
- c) Process and File System calls.

**SECTION - II**

**Q5) a) Explain in brief Super block in Linux.** **[8]**

- b) Explain file attributes, file operations, file types and file access methods. **[8]**

**Q6) a) Compare Linux OS with Windows.** **[8]**

- b) Explain system calls and library functions in Linux. **[8]**

**Q7) a) Explain layers in Linux system.** **[8]**

- b) Explain the Linux file system and directory structure. **[8]**

**Q8) Write short notes:** **[18]**

- a) I-node
- b) Linux kernel structure
- c) EXT2 file system of Linux

**XXXX**



Total No. of Questions : 8]

SEAT No. :

P4077

[Total No. of Pages : 2

[4860] - 248

**M.E. (E & TC) (Signal Processing)**

**COMPUTER VISION**

**(2008 Pattern) (Elective - IV (C))**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates :-*

- 1) *Question Nos. 1 and 5 are compulsory. Out of the remaining attempt 2 questions from Section I and 2 questions from Section II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** With the help of neat diagram explain the working of CCD camera.[9]

b) Explain camera parameters and camera matrix. [9]

**Q2) a)** What is perspective projection? Give properties of perspective projection. [8]

b) Explain, [8]

i) Homogeneous coordinate system.

ii) Affine transformation.

**Q3) a)** What is camera calibration? Explain procedure of camera calibration.[8]

b) What is orthographic and weak orthographic projection. [8]

**P.T.O.**

- Q4)** a) Explain epipolar line and epipolar constraint in stereo imaging? [8]  
b) What is Bayer filter array? How is it used to capture colour information? [8]

## SECTION - II

- Q5)** a) Explain iterative procedure of optical flow estimation using Kalman filter. [9]  
b) What is image rectification? Why is it required? [9]
- Q6)** a) What is infrared imaging? State their advantages and applications. [8]  
b) With the help of block diagram explain the principle of Tomography. [8]
- Q7)** a) Explain Fourier slice theorem for image reconstruction. [8]  
b) Give assumptions and constraints while establishing the correspondence between stereo images. [8]
- Q8)** a) Explain the following terms: [8]  
i) Foreshortening  
ii) Vanishing point  
b) What is aperture problem in optical flow estimation? How it is solved? [8]

**XXXX**

Total No. of Questions : 12]

SEAT No. :

**P4454**

**[4860] - 25**

[Total No. of Pages : 3

**M.E. (Civil) (Hydraulic Engineering)**

**a - CLOSED CONDUIT FLOW**

**(2008 Course) (501305) (Elective - II) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Figures to the right indicate full marks.*
- 2) *Draw neat sketches wherever necessary.*
- 3) *Assume suitable data if necessary.*
- 4) *Use of calculators allowed.*
- 5) *All questions are compulsory.*
- 6) *Answers to the two sections must be written separately.*

**SECTION - I**

- Q1) a)** What are the two arrangements for installation centrifugal pumps? What are merits of each? **[8]**
- b) A centrifugal pump works at 100 rpm, vane angle at outlet is  $60^\circ$ . Velocity of flow 3m/s is constant. Impeller diameter at exit is twice that at inlet. Manometric head and manometric efficiency are 30m and 70 percent respectively. Find **[10]**
- i) diameter of impeller at exit, and
  - ii) Vane angle at inlet.

OR

- Q2) a)** What do you understand by static head Manometric head and total head of a centrifugal pump? Explain Manometric, Mechanical and overall efficiencies of centrifugal pumps. **[9]**
- b) Derive the expression for specific speed of centrifugal pump. **[9]**

**P.T.O.**

- Q3)** a) Explain Water hammer theory (elastic and rigid) for pipeline flow for hydroelectric project. [8]
- b) Illustrate with the help of sketch variation in hydraulic gradient in a penstock with change of load. [8]

OR

- Q4)** a) What do you understand by a surge tank? Illustrate with sketches its different types. [8]
- b) Do we need surge tanks in tailrace tunnel? Illustrate various types with suitable sketches. [8]

- Q5)** a) A penstock 2000m long and  $m$  in diameter has a surge tank 20m diameter for a discharge of 30 cumecs. Friction factor is 0.018. Normal reservoir level is 500m. Determine maximum and minimum water levels in the tank. [8]
- b) Determine the pressure rise through water flowing elastic pipe 5 km long of 2m diameter, velocity of water 3m/s is suddenly stopped by a valve at turbine end. Assume  $\rho = 102\text{kg/m}^3$ ,  $E = 2.1 \times 10^6 \text{ kg/cm}^2$  and  $K = 21000 \text{ kg/cm}^2$ . Pipe thickness is 10mm. Also find the length of the pipe subjected to peak pressure. [8]

OR

- Q6)** a) What are the functions of surge tanks? Determine the pressure rise due to sudden closure of the valve at the end of steel penstock pipe 500m long carrying water at a velocity of 5m/s. Assume  $\sigma = 102$ . [8]
- b) Explain in detail differential surge tanks with expanded chambers. [8]

### SECTION - II

- Q7)** a) What are various components of water distribution system? Explain with sketches. [8]
- b) Explain in detail method of pipe network analysis. [10]

OR

- Q8)** a) Explain use of PIPE2000(KYPIPE) for design of pipeline. [9]  
b) Explain in detail contribution of computer science in planning and management of water supply. [9]

- Q9)** a) Explain use of SURGE program. [8]  
b) State basic equations of transient flow analysis in closed conduits and explain terms involved. [8]

OR

- Q10)**a) Explain use of HEC\_RAS(HEC2) program in managing water resources. [8]  
b) Explain use of Pipe2000-SWMM program. [8]

- Q11)**a) Explain classification of open channel flows. [8]  
b) What are gradually varied flows explain with sketches various GVF profiles. [8]

OR

- Q12)**a) What are rapidly varied flows (RVF) explain with sketches RVF. [8]  
b) Explain use of floodplain hydraulics in design of various civil engineering structures. [8]



Total No. of Questions : 10]

SEAT No. :

**P4078**

[Total No. of Pages : 3

**[4860] - 251**

**M.E. (E/TC) (Communication Networks) (Semester - I)**

**MODELLING AND SIMULATION OF COMMUNICATION  
NETWORKS**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates :*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of electronic pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** Explain how simulation helps in performance studies of the following types of communication systems. **[10]**

- i) Analytically tractable system.
- ii) Analytically tedious system.
- iii) Analytically intractable system.

**b)** Elaborate various methodologies used in mapping a problem into a simulation model. **[8]**

**Q2) a)** What are the aspects for selection of sampling frequency for a simulation? **[8]**

**b)** What is up sampling and down sampling? Illustrate these concepts with reference to simulation of a communication system. **[8]**

**P.T.O.**

**Q3) a)** What is direct component and quadrature component of a signal? Hence determine direct component  $x_d(t)$  and quadrature component  $x_q(t)$  for an angle modulated signal defined by [6]

$$x(t) = 10 \cos[2\pi(100)t + 2\sin(2\pi(10)t)]$$

b) What are various techniques to generate uniformly distributed random numbers. Compare and contrast the following algorithms. [10]

i) Mixed congruence algorithm

ii) Multiplicative algorithm with prime modulus.

**Q4) a)** What are the different methods to map uniform random variables to an arbitrary pdf? Explain in detail Rejection Method (Acceptance technique for generating random variable having desired pdf). [8]

b) What are PN sequence generators? Why do we need them? What are the components of a PN sequence generator? What are properties of a PN sequence? [8]

**Q5) a)** Illustrate any one of the graphical techniques used in typical simulation post processor. Demonstrate it with reference to  $\pi/4$  DQPSK system. [10]

b) What is effect of fixed point and floating point arithmetic on quantization error? [6]

## SECTION - II

**Q6) a)** Describe the situations when one will choose one of the following estimation routines based on the data generated by simulation process. [6]

i) Histogram

ii) PSD

iii) Gain, Delay and Signal-to-Noise Ratio

- b) Write an algorithm for simple Monte Carlo simulation for BPSK. Assuming AWGN channel, Data symbols at source output are independent and equally probable and No pulse shaping performed at transmitter. [12]
- Q7)** a) What is semi analytic simulation technique? Hence write an algorithm for semi analytic BER estimation for QPSK. [8]
- b) What are the different techniques to generate uncorrelated Gaussian random numbers? Explain any one in detail. [8]
- Q8)** a) Explain Saleh's quadrature model for nonlinearity with memory. [8]
- b) Enlist factors to be considered while simulating nonlinearities. [8]
- Q9)** a) What is tapped delay line model for LTV system? How various tap gains are generated? [8]
- b) What are the various specifications to be considered while simulating a radio channel? Elaborate multipath fading channel. [8]
- Q10)**a) Explain two state Markov model for discrete channel with memory.[8]
- b) Demonstrate valid and invalid uses of tail extrapolation. [8]

**XXXX**



Total No. of Questions : 8]

SEAT No. :

**P4079**

[Total No. of Pages : 2

**[4860] - 254**

**M.E. (E & TC) (Communication Networks)**

**Ad - hoc NETWORKS**

**(2008 Pattern) (Elective - I (C)) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates :-*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*

**SECTION - I**

- Q1)** a) What are the design issues and goals of MAC protocols for adhoc wireless Networks? [9]
- b) Compare Cellular Network and Adhoc Network. Explain any one application of Adhoc Network. [9]
- Q2)** a) Give the classification of Routing Protocols and compare the table driven routing protocol and on-demand routing protocol. [8]
- b) Explain Adhoc On Demand Distance Vector Routing Protocol (AODV). [8]
- Q3)** a) Explain QoS aware multicast routing protocol. [8]
- b) Explain energy efficient multicast routing protocol. [8]
- Q4)** a) What are the design issues and goals of TCP protocols for Adhoc wireless Networks? [8]
- b) Explain the following transport protocol. [8]
- i) Application Controlled Transport Protocol (ACTP)
  - ii) Split TCP.

***P.T.O.***

## SECTION - II

- Q5)** a) What is the need for energy management in Adhoc wireless Network? Which battery is commonly for portable mobile nodes such as Laptops? [9]
- b) Why power management is important in Adhoc wireless Network. Explain process power management? [9]
- Q6)** a) What are the design issues of multicast routing protocol for Adhoc wireless Network? [8]
- b) List and explain the properties of Adhoc wireless Network that causes difficulties for implementation of security in Routing protocols. [8]
- Q7)** a) Explain the MAC and Physical layer attacks. [8]
- b) Give classification of security attacks for Adhoc wireless Network. [8]
- Q8)** a) What are the issues and challenges for QoS support in Adhoc wireless Networks. [8]
- b) Explain any one of the following QoS frameworks. [8]
- i) INSIGNIA
  - ii) SWAN
  - iii) INORA

**XXXX**

Total No. of Questions : 8]

SEAT No. :

**P4080**

[Total No. of Pages : 2

**[4860] - 256**

**M.E. (E&TC) (Communication Networks)**

**NETWORK ARCHITECTURE AND DESIGN**

**(2008 Pattern) (Elective - II (b))**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates :-*

- 1) Answer to the two sections should be written in separate answer books.*
- 2) Answer any three questions from each section.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*

**SECTION - I**

- Q1) a)** With a suitable example explain the key characteristics of a network architecture and parameters that affect the post implementation cost?[8]
- b) Design network architecture for a university. [8]

- Q2) a)** Justify how system components play vital part in network analysis, architecture and design. [9]
- b) Giving online assignments to the users is a network project assigned to you. You are required to list the resources needed to gather user, application, device and network requirements? Briefly outline a method for gathering and deriving requirements in the absence of user involvement. [9]

- Q3) a)** Which flow models apply to each set of flows described below? [8]
- i) Users on internet accessing the same web server.
  - ii) 25 workstations processing batch jobs overnight, managed by the central mainframe.
  - iii) Email use across the internet.
  - iv) A transaction-processing application, authorizing credit card transaction between a company's retail stores and its headquarters.

***P.T.O.***

- b) Give reasons to prove that requirement analysis is important to network architecture and design? [8]

- Q4)** a) Give examples of external relationships between each of the following component architectures : addressing/routing, network management, performance and security. [8]
- b) Describe how an architecture design differ in its design, in terms of its scope, level of detail, description and location information. [8]

## SECTION - II

- Q5)** a) Develop two sets of initial conditions (each containing either type of network project, scope of network project and architecture/design goals) and give an example regarding network project for each set. [8]
- b) Explain any two flow models in detail. [8]

- Q6)** a) Give recommendations to choose and apply routing protocols. [8]
- b) Define critical flow. Where this flow analysis is used? [8]

- Q7)** a) Write Short notes: [8]
- |                   |                        |
|-------------------|------------------------|
| i) Prioritization | ii) Traffic Management |
| iii) Scheduling   | iv) Queuing            |
- b) Explain threat analysis with example. [8]

- Q8)** a) Explain the terms: [10]
- |                 |                |
|-----------------|----------------|
| i) State        | ii) Hard State |
| iii) Soft State | iv) Stateless  |
| v) Stateful     |                |
- b) What policies and procedures one should adapt for security of network? [8]

**XXXX**

Total No. of Questions : 8]

SEAT No. :

**P4081**

[Total No. of Pages : 2

**[4860] - 258**

**M.E. (E & TC) (Communication Networks)**

**WIRED AND WIRELESS NETWORKS**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates :*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the TCP/IP model with protocols at each layer. [8]  
b) State and explain four basic network topologies and write advantages of each type. [9]
- Q2)** a) Explain Go Back-N ARQ protocol and selective repeat ARQ protocol. [8]  
b) What is IEEE 802.11? Explain wireless LAN in brief. [9]
- Q3)** a) Explain the following: [6]  
i) Persistent CSMA  
ii) Non-persistent CSMA  
iii) P-persistent CSMA  
b) What is the difference between a unicast, multicast, and broadcast address? [6]  
c) Differentiate between pure ALOHA and slotted ALOHA. [5]

***P.T.O.***

- Q4)** a) How can we distinguish a multicast address in IPv4? How can we do so in IPv6? [8]
- b) What is socket address? Write socket address of web server for private IP addresses in class B and class D IPv4 addresses. [8]

## **SECTION - II**

- Q5)** a) Explain Distance vector routing algorithm and Link state routing algorithm. [9]
- b) What is ATM? Give the format of ATM cell and explain. [8]
- Q6)** a) Show the format of typical IP datagram header and explain. [9]
- b) Why is adaptive routing superior to non-adaptive routing? [8]
- Q7)** a) Explain the network connecting devices. [8]
- b) Define subnetting. How does the subnet mask differ from a default mask in classful addressing? [8]
- Q8)** a) What is NAT? How can NAT help in address depletion? [6]
- b) What is VPN and why it is needed. [6]
- c) Explain VLAN configuration. [5]

**XXXX**

Total No. of Questions : 8]

SEAT No. :

P4082

[Total No. of Pages : 2

[4860] - 259

**M.E. (E & TC) (Communication Networks) (Semester - II)**

**NETWORK TRAFFIC ANALYSIS & QoS**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates :-*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** Explain QoS oriented communication architecture and protocols. [8]

b) What is Bandwidth Allocation? Enlist the Bandwidth Realization parameter. Explain suitable value for the bandwidth reallocation parameters. [8]

**Q2) a)** Define congestion and explain in detail. [8]

b) What is traffic management, How it is beneficial for high speed network? [8]

**Q3)** Define traffic shaping and explain different types of traffic shaping techniques. [16]

**Q4)** Write short notes on [18]

- a) Grade of service
- b) Busy hours calling rate
- c) LAN traffic management

**P.T.O.**

## SECTION - II

- Q5)** a) Define and explain traffic measurement in detail. [8]  
b) Explain traffic scheduling. How it is useful for QoS? [8]
- Q6)** a) Explain traffic management planning and its methodology. [8]  
b) Define and explain Quality of Perception (QoP). [8]
- Q7)** a) Explain traffic engineering model and statistical analysis for real time traffic. [8]  
b) Explain multimedia management in detail. [8]
- Q8)** Write short note on [18]  
a) Delay, Jitter and availability  
b) Statistical parameters  
c) Token Bucket Algorithm

**XXXX**



Total No. of Questions : 8]

SEAT No. :

**P4455**

**[4860] - 26**

[Total No. of Pages : 2

**M.E. (Civil Hydraulics)**

**b-HYDROINFORMATICS AND SIMULATIONS**

**(2008 Course) (Semester - I) (Elective - II) (501305)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section. Q. No. 4 of section I and Q.No. 8 of section II are compulsory.*
- 2) *Answers to the two sections should be written in separate answer booklet.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data if necessary.*

**SECTION - I**

**Q1)** What are the different techniques used in Hydroinformatics to satisfy the huge water demand in industrial sector without disturbing the available water resource systems? Explain role of internet and web based modeling in the same regards. **[16]**

**Q2)** What is decision support system? Discuss in detail design of decision support system for Hydro-electric power Plant as a multi objective system. **[16]**

**Q3)** Discuss various methods of simulations. Discuss possible simulation model for predicting stage-discharge relationship of a river. **[16]**

**Q4) a)** Enlist practical Hydroinformatics soft tools available in the market and explain one with suitable example. **[8]**

**b)** Explain the role of government in implementing Decision Support System for the development of water resources systems through “Jal-Gram Yojana” or “Jal-Shiavr Yojana”. **[10]**

**SECTION - II**

**Q5)** Explain the statement “Artificial Neural Networks are gray boxes”. What is conjugate gradient algorithm? Explain different search routines of conjugate gradient algorithm. **[16]**

**P.T.O.**

**Q6)** Discuss the flow chart of Genetic Algorithm. Explain mutation, crossover and reproduction. **[16]**

**Q7) a)** What is the necessity of cross validation in ANN modeling? Explain any method of cross validation in detail. **[8]**

b) “GA works on the Darwinian Principle of survival of the fittest” Explain. **[8]**

**Q8)** Write short notes on: **[18]**

a) Gradient descent algorithm with momentum.

b) Applications of GA in Water resources Engineering.

c) Recurrent Neural Networks.



Total No. of Questions : 8]

SEAT No. :

**P4083**

[Total No. of Pages : 2

**[4860] - 260**

**M.E. (E&TC) (Communication Network) (Semester - II)**

**WIRELESS SYSTEM DESIGN**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates :-*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

**SECTION - I**

**Q1) a)** What is range of SWR? Describe relationship between reflection coefficient and SWR. **[8]**

b) Draw and describe block diagram of RF amplifier. Write equations of input and output reflection coefficients. **[8]**

**Q2) a)** What do you mean by stability of RF amplifier? Describe stabilization of input and output ports. **[8]**

b) Derive equation of transducer power gain. Also write its relation with available power gain and operating power gain. **[8]**

**Q3) a)** Draw and explain Clapp oscillator. What are advantages over Colpitts oscillator? **[8]**

b) What do you mean by negative resistance?  $R= 1K\Omega$ ,  $L= 20mH$ ,  $C=100$  nF, Compute resonant frequency and attenuation constant in negative resistance oscillator. **[8]**

**P.T.O.**

**Q4)** Write short note on any three of the following, [18]

- i) S-Parameters
- ii) Input reflection coefficients ( $\Gamma_{in}$ ) of terminated two port network.
- iii) Gunn element oscillator.
- iv) Characteristics of RF amplifier.

### SECTION - II

**Q5) a)** Draw and describe equivalent circuit of varactor diode. Also draw and describe VCO. [8]

b) What do you mean by quarter wave resonator? Compare it with RLC circuit. [8]

**Q6) a)** Draw and describe active double balanced mixer. [8]

b) What do you mean by Input third order intercept point and SPUR in mixer? [8]

**Q7) a)** What are output parameters of non-linearity based mixer? Describe each. Write equation of conversion gain of square-law mixer. [8]

b) What do you mean by source degeneration? Describe any one method of it in mixer. [8]

**Q8) a)** Describe cost versus performance issues in RF design. [6]

b) Write short note on any two of the following, [12]

- i) Link budget
- ii) Noise figure in mixer
- iii) Figure of merit of varactor diode

**XXXX**

Total No. of Questions : 8]

SEAT No. :

**P4084**

[Total No. of Pages : 2

[4860] - 261

**M.E. (E&TC) (Communication Networks)**  
**WIRELESS SENSOR NETWORK (Elective - III (a))**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates :-*

- 1) *Answer any three questions from each section.*
- 2) *Answer three questions from Section-I and three questions from section-II.*
- 3) *Answer to the two sections should be written in separate answer books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) Explain in detail Challenges and limitations of wireless sensor networks. [8]  
b) What are the Hardware and Software components of Wireless Networks? [8]
- Q2)** a) Enlist the various wireless data networks. Explain any three in detail.[8]  
b) Explain the early wireless networks. [8]
- Q3)** a) Explain in detail different Medium access control techniques. [8]  
b) Describe the design Constraints for WSNs and WNs. [8]
- Q4)** Write short note on: (any three) [18]  
a) The Physical Layer  
b) Partitioning Decision  
c) Cluster Tree Architecture  
d) Transducer Interfaces

***P.T.O.***

## SECTION - II

- Q5)** a) Explain the various Voltage Converters and Regulators. [8]  
b) Elaborate the concept of Energy Scavenging. [8]
- Q6)** a) Describe the antenna in terms of: [8]  
i) Characteristics  
ii) Efficiency & antenna placement  
iii) Bandwidth  
iv) Antenna Design choice  
b) Explain in detail the Victim circuits in receivers. [8]
- Q7)** a) Explain coupling mechanism and various methods used to avoid coupling problems? [8]  
b) Elaborate the Physical Properties related of the Electrostatic Discharge. [8]
- Q8)** Write short notes on (any three): [18]  
a) The IEEE 1451.5 Wireless Smart Transducer  
b) Detective/Corrective Techniques  
c) The ZigBee Alliance  
d) IEEE 802.15.4 low rate WPAN standard

**XXXX**

Total No. of Questions : 8]

SEAT No. :

**P4085**

[Total No. of Pages : 2

**[4860] - 262**

**M.E. (E & TC) (Communication Networks)**

**MOBILE COMPUTING**

**(2008 Pattern) (Elective - III (b))**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates :-*

- 1) Answer any three questions from each section.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain Logical & Physical channels in GSM system. [10]  
b) Explain the configurations of IMT-2000. [8]
- Q2)** a) What are various elements of VOIP? Explain them in brief. [8]  
b) Explain IEEE 802.11 WiFi system. [8]
- Q3)** a) What is Alamouti code in MIMO communication system? Explain the encoding & Decoding process. [8]  
b) Explain with schematic GPRS architecture. [8]
- Q4)** a) What is Spatial Multiplexing? Explain the Linear detection techniques used in S.M. [8]  
b) Explain in detail Bluetooth architecture. [8]

***P.T.O.***

## SECTION - II

- Q5)** a) What are advantages & challenges in LTE? Explain in detail. [8]  
b) What is Mobile Computing environment? Explain three tier architecture for the same. [10]
- Q6)** a) Explain the design of MAC management in IEEE 802.11 protocol.[8]  
b) Explain the steps involved in call delivery procedure in GSM network for GSM mobile originated call. [8]
- Q7)** a) Discuss the features and value added services in 3G Mobile Technology. [8]  
b) Explain call routing mechanism in VOIP. [8]
- Q8)** a) What are features of WML? Explain. [8]  
b) What is H.323? Explain in detail. [8]

**XXXX**



Total No. of Questions : 8]

**P4086**

SEAT No. :

[Total No. of Pages : 2

**[4860] - 263**

**M.E. (E&TC) (Communication Network) (Semester - II)**

**NETWORK SECURITY**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Compare SDMA, TDMA, FDMA and CDMA protocols used for digital cellular systems. **[16]**

**Q2)** Explain the Bluetooth security components and protocols using a neat figure. **[16]**

**Q3)** Describe the sybil attack and the sinkhole attack on sensor networks. What are the assumptions made by Localised Encryption and Authentication Protocol (LEAP) security protocol? **[16]**

**Q4)** Explain the concept of data gathering used in wireless sensor networks. **[18]**

**SECTION - II**

**Q5)** Explain the mathematical and Timing attacks on the security of RSA algorithm. **[16]**

**Q6)** Explain the Diffie - Hellman key exchange algorithm. **[16]**

**P.T.O.**

**Q7)** Explain the different functions of Secure / Multipurpose Internet Mail Extension (S/MIME) in detail. **[16]**

**Q8)** List and explain the transaction types supported by Secure Electronic Transaction (SET). **[18]**



Total No. of Questions : 10]

SEAT No. :

**P4087**

[Total No. of Pages : 2

**[4860] - 264**

**M.E. (E&Tc) (Communication Network)**

**SOFTWARE RADIO**

**(2008 Pattern) (Elective - IV(a))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) What is Software defined radio? How software defined radio is different than conventional radio? [8]  
b) How is software radio different than other radios? Explain the relation between cognitive radio and software radio. [8]
- Q2)** a) Explain how smart selection of ADC/DAC enables better design of software radio? [8]  
b) Explain the relation of software communications architecture (SCA) in relation with Software defined radio. [8]
- Q3)** a) What are different RF receivers used in software radio? [8]  
b) Explain the networking overview of JTRS Software Communications Architecture. [8]
- Q4)** a) Explain different types of transmitters used for SDR? [8]  
b) State and explain various RF front ends used in SDR. [8]
- Q5)** Write Short notes on(Any three) [18]  
a) Cognitive Radio Forum  
b) SDR hardware development issues (FPGA/CPLD/ASIC)  
c) SCA and JTRS compliance  
d) Core Framework

**P.T.O.**

## SECTION - II

- Q6)** a) What is smart antenna? Explain any one smart antenna architecture. [8]  
b) What is different adaptation algorithms used in smart antenna? Explain any one in brief. [8]
- Q7)** a) Why is it important for the RF components in an antenna array to have uniform Characteristics across the channels? [8]  
b) Explain system propagation loss with neat block diagram. [8]
- Q8)** a) Describe a typical low cost set up of SDR. [8]  
b) What is selection criterion for selecting SDR. [8]
- Q9)** a) What factors should be considered while selecting RTOS? [8]  
b) Explain any one RTOS [8]  
i) VxWorks  
ii) RTLinux
- Q10)** Write short notes on (Any three) [18]  
a) SPEAKEASY  
b) CORBA  
c) Joint Tactical Radio System  
d) Future of SDR  
e) Military application in SDR



Total No. of Questions : 8]

SEAT No. :

**P4088**

[Total No. of Pages : 2

**[4860] - 265**

**M.E. (E&TC) (Communication Networks)**

**NEURAL NETWORKS IN COMMUNICATION (Elective - IV)**

**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*
- 5) *Figures to the right indicates full marks.*

**SECTION - I**

- Q1)** a) Compare biological Neural Network with artificial neural network. [10]  
b) Discuss the Delta learning rule. [8]
- Q2)** a) what is drawback of single layer perceptron network? Explain multi layer perceptron with architecture [8]  
b) Comment on selection of weight, rate of learning rule, no. of hidden node in concern with design of network [8]
- Q3)** a) Generate the output of ANDNOT function using McCulloch-Pitts neuron. [8]  
b) With an architecture explain the training algorithm used in auto associative net. State the application algorithm of an auto associative net [8]
- Q4)** a) Write short notes on automatic language identification using telephone switch [8]  
b) Describe in detail the problem of congestion control in packet switching networks. How this problem can be solved using the neural networks?[8]

**P.T.O.**

## SECTION - II

- Q5)** a) Explain architecture and the training algorithm used in Kohonen self organizing feature map. [8]  
b) Discuss in detail Learning Vector quantization [8]
- Q6)** a) Explain architecture & training algorithm of radial basis function network [8]  
b) What is the basic concept behind Adaptive Resonance Theory (ART). Discuss two forms of ART Network. [8]
- Q7)** a) Neural network applications in Telecommunication [8]  
b) Explain support vector machine in detail [8]
- Q8)** Write short notes on (ANY THREE) [18]  
i) Hopfield network  
ii) Simulated annealing  
iii) neocognitron net  
iv) BAM network  
v) Neural Network channel equalization



Total No. of Questions : 8]

SEAT No. :

**P4089**

[Total No. of Pages : 2

**[4860] - 267**

**M.E. (Electronics) (Digital System) (Semester - I)**

**MICROELECTRONICS**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any Three Questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of non-programmable electronic calculators is allowed.*

**SECTION - I**

- Q1)** a) What do you mean by transistor sizing ? What is the impact of transistor sizing on voltage transfer characteristics of CMOS inverter? [8]
- b) Design 4:1 Multiplexer using transmission gate. Compare this schematic with the conventional gates. [8]
- Q2)** a) What do you mean by  $\lambda$  parameter? What is technology scaling? Compare constant field Scaling and Lateral scaling. [10]
- b) Draw the stick diagram for 3 Input NAND gate. Estimate cell width and height. [6]
- Q3)** Draw the complementary CMOS logic and stick diagram of the following circuits. [16]
- a)  $Y = \overline{(A+B+C)}.D$
- b)  $Y = \overline{(\overline{A}B + \overline{C}D)}$
- Q4)** Write short notes on (any three): [18]
- a) NORA Logic
  - b) Power Dissipation in CMOS circuits
  - c) Off-chip connections
  - d) Global Routing

**P.T.O.**

## SECTION - II

- Q5)** a) Write VHDL code for Full Adder using structural modeling. [8]  
b) What is the difference between functions and procedures? [8]
- Q6)** a) Explain MOS implementation of a current sink along with its IV characteristics. [8]  
b) Explain Domino Logic in detail. [8]
- Q7)** a) Explain data objects used in VHDL with appropriate examples. [8]  
b) Explain in detail power dissipation in CMOS circuits. [8]
- Q8)** Write short note on (any three): [18]  
a) MOS diode  
b) VHDL modeling styles  
c) CMOS parasitics  
d) Data types in VHDL





Total No. of Questions : 6]

SEAT No. :

**P4090**

[Total No. of Pages : 2

**[4860] - 269**

**M.E. (Electronics) (Digital Systems)  
SIGNAL PROCESSING ARCHITECTURES  
(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections must be written in separate answer papers.*
- 2) *Answer any two questions from each section.*
- 3) *Figure to the right indicates full marks.*
- 4) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain DSP with block diagram and also explain advantages and disadvantages of digital over analog signal processing. [8]
- b) Explain the relation between Fourier transform and Z transform. [8]
- c) Derive the equations for DIT FFT radix-2 algorithm. Draw the butterfly diagram for the same. Justify how FFT is faster than DFT. [9]
- Q2)** a) Determine 4 pt. DFT of the given DT signals. Also plot their magnitude and phase spectra. [8]
- i)  $x[n] = \{0.2, 0.3, 0.4, 0.5\}$
- ii)  $x[n] = \{4, 2, 1\}$
- b) Compute circular convolution using DFT and IDFT for the following sequence.  $x_1[n] = \{2, 1, 1, 3\}$  and  $x_2[n] = \{2, 1, 1, 5\}$  [8]
- c) Design low pass FIR filter using rectangular window with passband gain of unity, cut off frequency of 100 Hz and sampling frequency of 500 Hz. Assume the length of impulse response as 7. [9]
- Q3)** a) Determine the response of FIR filter using DFT for  $x[n] = \{2, 1\}$  and  $h[n] = \{2, 2\}$ . [10]
- b) How multirate systems are described using dataflow graphs? [7]
- c) Write short note on [8]
- i) Data flow graph
- ii) Multirate sampling

**P.T.O.**

## SECTION - II

- Q4)** a) Design second order digital butterworth band stop filter with following specifications. [9]  
 $F_{c_1} = 155 \text{ Hz}$   
 $F_{c_2} = 180 \text{ Hz}$   
 $F_s = 400 \text{ Hz}$
- b) Draw and explain the architecture of TMS320C67XX processors. [8]
- c) How DMA helps in increasing the processing speed of a DSP processor? [8]
- Q5)** a) Explain different on chip resources available in TMS320C54XX processor. [9]
- b) Explain different addressing modes of TMS320C54XX processor. [8]
- c) Explain pipeline operations of TMS320C67XX processors. [8]
- Q6)** a) What are quadrature mirror filters? How do they provide perfect reconstruction? Support your answer mathematically. [7]
- b) Write short notes on : [18]
- i) Code composer studio
  - ii) Blacfin processor
  - iii) Finite word length effects



Total No. of Questions : 6]

SEAT No. :

**P3966**

**[4860] - 27**

[Total No. of Pages : 2

**M.E. (Civil / Hydraulics)**

**HYDROPOWER**

**(2008 Pattern)**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Discuss in detail – Water demand planning and power demand planning. **[6+6]**
- b) Write a note on: ‘Service operation flexibility’ of hydropower. **[8]**
- c) ‘Hydropower is treated as environment friendly power’, justify. **[5]**
- Q2)** a) Explain ‘power intake with trash rack’ as one of the components of storage power plant. **[10]**
- b) Write a detailed note on ‘Annual load factor’. **[10]**
- c) Briefly Hydro-Thermal mix. **[5]**
- Q3)** a) Define powerhouse and explain its components with neat diagram. **[12]**
- b) Write a short note on :
- i) Lake tapping. **[5]**
  - ii) Underground powerhouse with suitable example. **[8]**

**P.T.O.**

## SECTION - II

- Q4)** a) Write a note on applications of surge tank. [10]  
b) Explain the importance of 'Economic Diameter of a Penstock'. [5]  
c) Discuss advantages and limitations of buried penstocks. [10]
- Q5)** a) Determine minimum number of Francis turbines required for a power plant having 300cumec flow and 30 m head. The generator is directly coupled to the turbine which has specific speed of 300 rpm, efficiency 80 %. The frequency of generation is 50 cycles/s and number of poles used is 24. [8]  
b) Derive the equation for suction head developed due to provision of draft tube. [10]  
c) Describe governing of impulse turbine with neat sketch. [7]
- Q6)** a) Explain portable micro hydro unit for non perennial streams. [15]  
b) Write a note on micro hydro potential in India. [10]



Total No. of Questions : 8]

SEAT No. :

**P4091**

[Total No. of Pages : 2

**[4860] - 271**

**M.E. (Electronics) (Digital System)  
ADVANCED DIGITAL SYSTEM DESIGN  
(Semester - I) (2008 Pattern) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Describe the issues in design of data path and control unit of a processor. Design sequential circuit to compute the product of two binary numbers. Justify the design process of data path and control path cannot be independent.

**[16]**

**Q2)** a) Implement the Boolean function  $f = x_1 x_2 + x_1 x_3$

**[8]**

i) Which type of Hazards exist in the circuit

ii) Derive the Hazard free circuit of above Boolean function

b) Explain ASM chart for shift and add multiplier.

**[8]**

**Q3)** a) Draw the Built in Self Test (BIST) arrangement. Explain BIST for sequential circuit. Draw the necessary block diagram.

**[8]**

b) Draw the sequential circuit to compute the mean of K numbers. Draw the ASM chart and data path circuit.

**[8]**

**Q4)** Write short notes on (any three)

**[18]**

a) Address and data path architecture of CPU

b) Fault tree analysis

c) Switch bouncing

d) H - tree clock distribution network

**P.T.O.**

## SECTION - II

- Q5)** a) Find the Hazard free minimum cost of implementation of the function  $F(X_1, X_2, X_3, X_4) = \Sigma m(0, 4, 11, 13, 15) + D(2, 3, 5, 8)$  [8]
- b) Explain in detail the pipelined processor architecture. Discuss the design considerations of parallel processing hardware units. [8]
- Q6)** a) Explain in depth the significance of termination of finite transmission line in  $Z_0$ . [8]
- b) With reference to Digital System Design define and explain with suitable examples. [8]
- i) Reliability
  - ii) Reliability function
  - iii) Failure rate
  - iv) MTBF
- Q7)** a) What is SRAM cell? Design  $2 \times 2$  array of SRAM cell and explain it's operation. [8]
- b) Describe the following design issues with respect to implementation of large circuits on PCB [8]
- i) Cross talk
  - ii) Power supply noise
  - iii) Reflections and
  - iv) Terminations
- Q8)** Write a short notes on any three [18]
- a) Boundry Scan
  - b) PR BSG
  - c) Structure of network design tool
  - d) Static Hazards



Total No. of Questions : 8]

SEAT No. :

**P4092**

[Total No. of Pages : 2

**[4860] - 272**

**M.E. (Electronics) (Digital Systems) (Semester - I)**  
**WIRELESS & MOBILE TECHNOLOGIES (Elective - I)**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables ,slide rule and electronic calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Name the main elements of the GSM system architecture and describe their functions. Which types of different services does GSM offer? [9]  
b) Write short note on Channel Planning for Wireless Systems. [8]
- Q2)** a) If 20 MHz of total spectrum is allocated for a duplex wireless cellular system and each simplex channel has 25 KHz RF bandwidth, [8]  
find:  
i) the number of duplex channels.  
ii) the total number of channels per cell site, if  $n=4$  cell reuse is used.  
b) How is mobility restricted using WLANs? What additional elements are needed for roaming between networks, how and where can WLANs support roaming? In your answer, think of the capabilities of layer 2 where WLANs reside. [9]
- Q3)** a) If a mobile is located 5 km away from a base station and uses a vertical  $\lambda/4$  monopole antenna with a gain of 2.55 dB to receive cellular radio signals. The E-field at 1 km from the transmitter is measured to be  $10^3$  V/m. The carrier frequency used for this system is 900 MHz. [8]  
i) Find the length and effective aperture of the receiving antenna.  
i) Find the received power at the mobile using the two-ray ground reflection model assuming the height of the transmitting antenna is 50 m and the receiving antenna is 1.5 m above ground.  
b) Explain the free space propagation model used for prediction of received signal strength between transmitter and receiver having clear, unobstructed LOS path [9]

**P.T.O.**

- Q4)** a) Explain packet flow if two mobile nodes communicate and both are in foreign networks. What additional routes do packets take if reverse tunneling is required? [8]
- b) Explain in brief, the various techniques used for improving the coverage and capacity in Cellular systems? [8]

### SECTION - II

- Q5)** a) Consider the HIPER LAN 2 standard that uses BPSK and  $r=3/4$  codes for 9 Mbps information transmission and 16-QAM with the same coding for the actual payload data transmission rate of 26 Mbps.
- i) Calculate the coded symbol transmission rate per subcarrier for each of the two modes. What is the bit transmission rate per subcarrier for each of the two modes?
- b) If one switches from 36 Mbps mode to 9 Mbps mode, how much more (indB) of the path loss can it afford? [16]
- Q6)** a) Discuss in brief the various technologies used for High Speed WLANs [8]
- b) Explain the problem of hidden and exposed terminals. Also explain near-far effect. [9]
- Q7)** a) Explain Mobile TCP. State the advantages and disadvantages of M-TCP? [9]
- b) Define components and interfaces of the WAP architecture. [8]
- Q8)** a) Draw the IEEE802.11 MAC data frame format and explain the different fields contained in the frame control field of MAC frame format [10]
- b) Write short note on DHCP [7]





Total No. of Questions : 8]

**P4093**

SEAT No. :

[Total No. of Pages : 2

**[4860] - 273**

**M.E. (E&TC) (Digital Systems)**

**MACHINE INTELLIGENCE**

**(2008 Pattern) (Revised)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What is soft computing intelligence? Compare soft computing intelligence with artificial intelligence. **[8]**
- b) Discuss with example membership function (MF) formulation in one and two dimensions. Describe the process of construction MFs for composite linguistic term. **[8]**
- Q2)** a) What is derivative based optimization explain in brief. **[8]**
- b) Draw the block diagram for the inverse learning method. Explain in detail the training and application phase of the ANFIS controller. **[8]**
- Q3)** a) Describe in detail the learning vector quantization (LVQ) method used for adaptive data classification based on training data with desired class information. **[8]**
- b) With suitable example explain sugeno fuzzy model. **[8]**
- Q4)** Write short note on (any three) **[18]**
- a) Advanced neuro - fuzzy modeling
  - b) Tsu Kamoto model
  - c) Fuzzy rules
  - d) Soft computing characteristics

**P.T.O.**

## SECTION - II

- Q5)** a) What is ADLINE networks? With suitable example explain perceptron learning rule. [8]  
b) What is unsupervised learning? Explain the different node functions used in neural network. [8]
- Q6)** a) What is feedforward network? With suitable example explain backpropagation learning rule. [8]  
b) What are applications of Hopfield network? Mention the different steps involved in training of Hopfield network. [8]
- Q7)** a) Explain Reinforcement learning with suitable example. [8]  
b) What do you mean by Principal component analysis. Compare principal component analysis and regression analysis. [8]
- Q8)** Write short note on (any three) [18]  
a) Radial basis function networks  
b) Feedback control system used in ANN  
c) Adaptive neuro-fuzzy interface systems  
d) Self organizing networks.



Total No. of Questions : 10]

SEAT No. :

**P4094**

[Total No. of Pages : 2

**[4860] - 275**

**M.E. (Electronics) (Digital System) Theory**

**MEMORY TECHNOLOGIES**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the 2 sections should be written in separate books.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Figures to right indicate full marks.*

**SECTION - I**

- Q1)** a) Draw and explain various SRAM circuit elements. [4]  
b) Draw and explain in detail the BiCMOS Technology. [6]  
c) Explain SOI Technology. [6]
- Q2)** a) Explain with a diagram a simple trench cell and stacked capacitor cell structure DRAM. [8]  
b) Explain high speed DRAM in detail with the help of functional block diagram. [8]
- Q3)** a) Explain with block diagram OTP EPROM. [10]  
b) Explain with a diagram floating gate EPROM cell. [6]
- Q4)** a) Explain in detail FLOTOX (Floating Gate Tunneling Oxide Technology)[8]  
b) Explain in detail nonvolatile SRAM. [8]
- Q5)** Write short notes (any three): [18]  
a) Single stack at fault Model  
b) Pattern Sensitive fault  
c) Antifuse, explain in brief  
d) IDDQ Fault modeling and Testing

**P.T.O.**

## SECTION - II

- Q6)** a) Explain in detail the general design for testability techniques? [8]  
b) What are the various types of radiation and corresponding transistor / circuit level parameter degradation and failures. [8]
- Q7)** a) What is FRAM? Explain working principle of same. [8]  
b) Explain in detail assembly and packaging related failures. [8]
- Q8)** a) Explain in detail issues related to DRAM reliability. [8]  
b) Explain in detail the design considerations for reliability. [8]
- Q9)** a) Compare MRAM, SRAM, DRAM, EEPROM and FRAM. [8]  
b) List most commonly used memory packages for both insertion and surface mounting technologies. [8]
- Q10)** Write short notes (any three): [18]  
a) Analog memories  
b) FRAM's reliability issues and radiation effects  
c) Digital tablet PC  
d) LCD



Total No. of Questions : 8]

SEAT No. :

**P4095**

[Total No. of Pages : 2

**[4860] - 276**

**M.E. (Electronics) (Digital Systems)**

**EMBEDDED SYSTEMS**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Describe the marketing window. Describe with suitable examples why it is so important for embedded products to reach the market early in this window? [8]
- b) Describe the common design matrices of embedded systems. [8]
- Q2)** a) Explain how 5 stages of ARM 9 improve performance as compared to 3 stages pipeline in ARM7 processor? [8]
- b) Describe the I<sup>2</sup>C bus protocol with its timing diagram and list out its features. [8]
- Q3)** a) Explain the selection criteria required for embedded operating systems. Also compare any 3 embedded operating systems along with its performance. [8]
- b) Explain the need for communication interface in embedded system? Explain IEEE 802.11 protocol with its data transfer mechanism. [8]
- Q4)** Write short notes on any three: [18]
- a) IDE tools used in embedded systems.
  - b) Waterfall model for development of embedded system.
  - c) Hardware architecture of embedded systems.
  - d) Thumb instruction mode of ARM processor.

**P.T.O.**

## SECTION - II

- Q5)** a) Explain the importance of semaphore during shared data problems in resource sharing. [8]  
b) What is scheduler in RTOS? Explain pre-emptive and non pre-emptive scheduling with examples. [8]
- Q6)** a) Explain what is inter-process communication. Also explain how various functions of  $\mu$ cos-II operating system can be used for inter-process Communication. [8]  
b) Briefly explain features of  $\mu$ cos-II operating system and describe how these features make  $\mu$  cos-II operating system suitable for embedded system design. [8]
- Q7)** a) Compare Conventional Operating System and Real Time Operating System. List different RTOS and compare its feature. [10]  
b) Describe the round robin architecture with interrupt. [8]
- Q8)** a) Describe the necessity of code optimization in Embedded System Design. Describe important code optimization guidelines. [8]  
b) Write short notes on: [8]  
i) Vx Works RTOS  
ii) Memory management functions of RTOS



Total No. of Questions: 8]

SEAT No. :

P4096

[Total No. of Pages : 2

[4860] - 277

**M.E. (Electronics - Digital Systems) (Semester - II)**  
**COMMUNICATION NETWORK AND SECURITY**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) List the entities of mobile IP and describe data transfer from a mobile node to a fixed node and vice versa. Why and where is encapsulation needed? **[8]**
- b) How is mobility restricted using WLANs? What additional elements are needed for roaming between networks, how and where can WLANs support roaming? **[8]**
- Q2)** a) Discuss the issues in designing MAC Protocols for MANETs. Discuss the classification of them in brief. **[8]**
- b) Explain hidden terminal problem. How do IEEE 802.11, HiperLAN2 solve the hidden terminal problem? **[8]**
- Q3)** a) Explain the concept of data dissemination and data gathering in Wireless Sensor Network (WSN). **[8]**
- b) Classify Routing protocols for Mobile Adhoc networks (MANETs). Explain AODV (AdHoc On-Demand Distance-Vector) Routing Protocol in detail. **[8]**

**P.T.O.**

**Q4) Write short notes (Any Three) [18]**

- i) IEEE 802.11 Infrastructure networks v/s Adhoc networks
- ii) Bluetooth
- iii) Snooping TCP
- iv) DHCP

### **SECTION - II**

**Q5) a) Give detailed classification of Security Services, Security Mechanisms and Security Attacks. [8]**

b) What is the purpose of the S-Boxes in DES? Explain the S-BOX design criteria. Explain the strengths of DES in brief. [8]

**Q6) a) What requirements should a Digital Signature scheme satisfy? What are the properties a digital signature should have? What are some threats associated with a direct digital signature scheme? [8]**

b) Explain AES Algorithm in detail. [8]

**Q7) a) Explain possible approaches to attacking the RSA algorithm. [8]**

b) What is IPSec? Explain different parameters used for defining security association. [8]

**Q8) Write short notes (Any Three) [18]**

- i) IDEA Symmetric Key Algorithm
- ii) S/MIME
- iii) Secure Electronic Transaction (SET)
- iv) Encapsulating Security Payload (ESP)





Total No. of Questions: 8]

SEAT No. :

P4097

[Total No. of Pages : 2

[4860] - 278

M.E. (Electronics) (Digital System)

IMAGE PROCESSING & PATTERN RECOGNITION

(2008 Pattern) (Semester - II)

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) Explain in detail the Smoothing transformations. Discuss linear & nonlinear Smoothing operator. [8]
- b) Explain the process of detecting an object having a certain size, shape & orientation in an image. [8]
- Q2)** a) What is the process of histogram equalization? Discuss algorithm for contrast enhancement using histogram equalization. [9]
- b) Explain Laplacian operator. What is its drawback? Explain Laplacian of Gaussian operator. Sketch the gradient & Laplacian for a typical edge model. [9]
- Q3)** a) State & explain examples of the problems to which pattern recognition techniques are applied. [8]
- b) Explain Binomial and Poisson distribution. [8]

**P.T.O.**

- Q4)** a) Discuss three kinds of estimation of parameters from samples. [10]
- b) Consider an electrical circuit in which the voltage is normally distributed with mean 120 & standard deviation 3. What is the probability that the next reading will be between 119 & 121 volts? [6]

## SECTION - II

- Q5)** a) Discuss two basic ways for estimating the composition of populations. [8]
- b) Describe the methods for evaluating the error rate of a classifier. [8]
- Q6)** a) Explain the steps in adaptive decision boundary algorithm. [8]
- b) Describe nearest neighbor classification techniques & discuss K- nearest neighbor technique. [8]
- Q7)** a) What is hierarchical clustering. Explain Agglomerative clustering algorithm. [8]
- b) Describe basic building blocks of Artificial Neural Network (ANN). Construct an ANN to produce logical OR operation. [8]
- Q8)** Write short notes on the following (Any Three): [18]
- a) Support Vector Machine
  - b) Partitional Clustering
  - c) Kernel and window estimators
  - d) Baye's theorem



Total No. of Questions : 8]

SEAT No. :

**P4456**

**[4860]-28**

[Total No. of Pages : 2

**M.E. (Civil) (Hydraulic Engg.)  
OPEN CHANNEL HYDRAULICS  
(2008 Course) (Semester-II) (501308)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithms tables, slide rule, Mollier charts, electronics pocket calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) A discharge of  $20 \text{ m}^3/\text{s}$  flows in a rectangular channel 10 m wide set to a slope of  $10^{-4}$ . Find the normal depth of flow if  $n = 0.012$ . [8]
- b) Define conveyance, second hydraulic exponent, normal depth, critical depth in relation with open channel flow. [8]
- Q2)** a) Write in detail about control of jump by baffle blocks. [8]
- b) Derive relation between conjugate depths for a rectangular channel. [8]
- Q3)** a) Integrate the dynamic equation of GVF by Chow's method and derive equation for distance between two sections across a profile. [8]
- b) Explain  $M_1$ ,  $S_3$  and  $A_2$  profile with a neat sketch. [8]
- Q4)** Write short notes on (Any Three): [18]
- a) Assumptions involved in the analysis of GVF.
  - b) Characteristics of hydraulic jump on sloping floor.
  - c) Relation between Manning's 'n' and Chezy's C.
  - d) Velocity distribution in open channel.

**P.T.O.**

**SECTION-II**

**Q5) a)** What is spatially varied flow? Explain its different types with sketches. State the assumptions made for deriving the dynamic equation for spatially varied flow. **[8]**

b) Derive De-Marchi equation for side weirs. **[8]**

**Q6) a)** Explain method of characteristics for flood routing. **[6]**

b) Route the following flood through a reach for which  $K = 12$  h and  $x = 0.2$ . At  $t = 0$  the outflow discharge is  $10 \text{ m}^3/\text{s}$ . Use Muskingum method **[12]**

Time (h)	0	6	12	18	24	30	36	42	48	54
Inflow ( $\text{m}^3/\text{s}$ )	10	20	50	60	55	45	35	27	20	15

**Q7) a)** Derive dynamic equation of monoclinal rising wave. **[8]**

b) A rectangular channel 3 m wide has a flow of  $3.6 \text{ m}^3/\text{s}$  with a velocity of 0.8 m/s. If a sudden release of additional flow at upstream end of the channel causes the depth to rise by 50% determine the absolute velocity of resulting surge and new flow rate. **[8]**

**Q8) Write short notes on:** **[16]**

- a) Assumptions made in deriving equation for spatially varied flow with increasing discharge.
- b) Bottom rocks.
- c) Dam break problem.
- d) Solitary wave.



Total No. of Questions: 8]

SEAT No. :

P4098

[Total No. of Pages : 2

[4860] - 280

**M.E. (Electronics) (Digital Systems) (Semester - II)**  
**BIOMEDICAL SIGNALS & SYSTEMS (Ele - III)**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume Suitable data, if neccessary.*

**SECTION - I**

- Q1)** a) Write minimum and maximum values of ECG signal voltages and frequencies. State different frequency bands and their applications in ECG signal analysis. **[8]**
- b) Explain the artifacts in ECG signals and selection of appropriate filter for removal of artifacts. **[10]**
- Q2)** a) Explain significance of P wave in ECG signal and method of adaptive segmentation for separation of P wave in ECG signal. **[8]**
- b) Explain use of homomorphic filter in ECG signal processing. **[8]**
- Q3)** a) Differentiate between Normal and Ectopic ECG Beats. Explain frequency domain techniques to detect ectopic ECG beats. **[8]**
- b) Explain significance of power spectral density and measures derived from it in analyzing ECG signals. **[8]**

**P.T.O.**

**Q4)** Write short note on

- a) Morphological analysis of ECG signals. [8]
- b) Correlation analysis of multichannel EEG signal. [8]

**SECTION - II**

**Q5) a)** Draw a 3-layer feed –forward Neural Network. Explain the Back propagation training algorithm in detail. [10]

- b) Explain the techniques of modeling biomedical systems. [8]

**Q6) a)** Explain in detail spectral analysis of PCG signal. [8]

- b) Explain the distinction between pattern and data. What are different methods for solving pattern recognition task? [8]

**Q7) a)** What is logistic regression explain its application in ECG signal classification? [8]

- b) Explain supervised learning and unsupervised learning with example of each. Explain any one supervised learning method used in Artificial Neural Network. [8]

**Q8)** Write short notes on

- a) Diagnostic accuracy and reliability of classifier [8]
- b) Analysis of PCG signals [8]



Total No. of Questions: 8]

SEAT No. :

P4099

[Total No. of Pages : 3

**[4860] - 281**  
**M.E. (Electronics - Digital System)**  
**EMBEDDED VIDEO PROCESSING**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of electronic pocket calculator is allowed.*
- 6) Assume Suitable data, if neccessary.*

**SECTION - I**

- Q1)** a) Discuss the different methods of video quality measurement. Indicate advantages & drawback of each method. **[8]**
- b) Explain the different color spaces indicating their various applications. **[8]**
- Q2)** a) State the objectives of MPEG - 2 standard. Draw a neat block diagram of MPEG Encoder & explain function of each block. **[8]**
- b) Explain the following terms in context with motion compensation in MPEG standard -
- i) Search region
  - ii) Cost function
  - iii) Local smoothness constraint
  - iv) Motion vector **[8]**

**P.T.O.**

- Q3)** a) State the various requirements of motion estimation and compensation. [6]  
b) Define rate - distortion function. Using the same compare the performance of motion compensation based & intra - frame based video coding techniques. [6]  
c) Explain the different quantization techniques. [6]

**Q4)** Write short notes on -

- i) Arithmetic coding  
ii) H. 261  
iii) H. 263  
iv) Digital signal processors [16]

### SECTION - II

- Q5)** a) Explain the important factors to be considered while transmitting the coded video signal. [6]  
b) State the technical specifications of video CODEC. [6]  
c) Explain how camera noise is filtered by per - filtering process. [6]
- Q6)** a) State & explain various Qos requirements. [8]  
b) Discuss the different issues in video codec interface. [8]
- Q7)** a) Explain in detail Huffman coding of quantized DCT coefficients in baseline JPEG. [8]  
b) Compare -  
i) JPEG with MPEG  
ii) Arithmetic coding with Huffman coding [8]



- Q8)** a) State the important features & capabilities of -
- i) Media processor
  - ii) Embedded processor **[8]**
- b) Prove - Fast search algorithm gives poorer compression performance than full search algorithm. **[5]**
- c) A frame in HDTV has resolution of  $1920 \times 1152$  with typical frame rate of NTSC system. Estimate the computational complexity for motion estimation if full search & 2 - D logarithm search algorithm are used. **[3]**



Total No. of Questions: 8]

SEAT No. :

P4100

[Total No. of Pages : 2

[4860] - 284

M.E. (Electronics) - Digital System (Semester - II)

DIGITAL SIGNAL COMPRESSION

(2008 Pattern) (Elective - IV)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate answer books.
- 2) Answer any three questions from each section.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Use of Calculator is allowed.
- 6) Assume Suitable data if necessary.

**SECTION - I**

- Q1) a) What is a prefix code? Explain how to check if a code is a prefix code using a root tree. Define self-information associated with the event. [8]
- b) For the wavelet decomposition shown below, [10]

26	6	13	10
-7	7	6	4
4	-4	4	-2
2	-2	-3	0

Find the bit stream generated after first and second pass by SPIHT coder.

- Q2) a) Explain Linear Predictive coding for speech. How to select the order of the predictor. [8]
- b) Consider a source with symbol probabilities  $P(a_1) = 0.7$ ,  $P(a_2) = 0.05$  and  $P(a_3) = 0.25$ . Find the tag using arithmetic coding for a sequence  $a_1, a_3, a_2$  [8]

P.T.O.

- Q3)** a) What is adaptive quantization? How step size will adaptively change by tracking the statistics of signal? How to select optimal delta? [8]  
b) Explain rate distortion theory? How it minimizes distortion? [8]

- Q4)** a) Explain how MIDI is used for interfacing musical instruments. [8]  
b) What are advantages of ADPCM over PCM technique? Explain ADPCM with block schematic in detail. [8]

### **SECTION - II**

- Q5)** a) What is adaptive quantization? How step size will adaptively change by tracking the statistics of signal? How to select optimal delta? [8]  
b) What is streaming video? How to decide buffer size? [8]

- Q6)** a) What are the features of MP3? Explain with suitable block diagram the structure of MP3 audio coder. [8]  
b) What is subband coding? What is its advantage? Describe the filters used for subband coding. [8]

- Q7)** a) Explain Discrete Cosine transform and its properties. How the image compression is achieved by coding of DCT coefficients. [8]  
b) Explain how to decide the transmission rate if the tolerable distortion is given. [8]

- Q8)** a) Explain block diagram of Video Coding Layer (VCL) for motion estimation & compression. [9]  
b) With the help of suitable block diagram explain the encoding and decoding process in JPEG 2000. [9]



Total No. of Questions : 10]

SEAT No. :

**P4512**

**[4860]-285**

[Total No. of Pages : 4

**M.E.(Production Engineering)**  
**MATHEMATICS AND STATISTICS**  
**(2008Course) (Semester-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from section I and three questions from section II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams should be drawn whenever necessary.*
- 4) *Figure to the right indicate full marks.*
- 5) *Use of non programmable pocket calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION-I**

**Q1)** a) Define an analytic function of  $w=f(z)$  at the point  $z = z_0$  and show that the function defined by  $w = |z|^2$ , for any complex variable  $z$  is differentiable at the origin  $O$  but not analytic at that point. [5]

b) Show that the Cauchy Riemann equations, namely  $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}$ ,  $\frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$  are the necessary conditions for a function  $w = f(z) = u + iv$  to be analytic at  $z = z_0$  and also state the sufficient conditions. [6]

c) Find the Laurent's series expansion for  $f(z) = \frac{1}{(z-1)(z-2)}$  in the region:  $0 < |z-1| < 1$ . [5]

**Q2)** a) Find the bilinear transformation, which transforms  $z=i,0,-i$  onto  $w=1, i,-1$  and maps  $\text{Re}(z) \geq 0$  onto  $|w| \leq 1$ . [6]

b) Evaluate  $\int_C (Z - Z^2) dz$ , where  $C$  is the upper half of the circle  $|z| \leq 1$ . What is the value of this integral if  $C$  is the lower half of the above circle? [5]

c) Using Cauchy's residue theorem, evaluate  $\int_0^{2\pi} \frac{\cos 3\theta}{5 - 4\cos\theta} d\theta$  [5]

**P.T.O.**

**Q3) a)** Find the values of  $u(x,t)$  satisfying the parabolic equation  $\frac{\partial u}{\partial t} = 4 \frac{\partial^2 u}{\partial x^2}$  subject to the boundary conditions  $u(0,t) = 0 = u(8,t)$  and  $u(x,0) = 4x - \frac{1}{2}x^2$  at the points  $x = i, i = 0, 1, 2, \dots, 8$  and  $t = \frac{1}{8}j, j = 0, 1, 2, \dots, 5$ . [9]

b) Evaluate the pivotal values of the equation  $\frac{\partial^2 u}{\partial t^2} = 16 \frac{\partial^2 u}{\partial x^2}$  taking  $\Delta x = 1$  upto  $t = 1.25$ . The boundary conditions are  $u(0,t) = u(5,t) = 0$  and  $u(x,0) = x^2(5-x)$ . [8]

**Q4) a)** Using residue theorem for an improper integral, show that

$$\int_0^{\infty} \frac{1}{1+x^2} dx = \frac{\pi}{2\sqrt{2}} \quad [8]$$

b) Solve the Poisson's equation  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 8x^2y^2$  for the square mesh of the sides  $-2 \leq x \leq 2, -2 \leq y \leq 2$  with  $u(x,y) = 0$  on the boundary taking  $h = 1$ . [9]

**Q5) a)** Find the curves on which the functional  $\int_0^1 [(\frac{dy}{dx})^2 + 12xy] dx$  with  $y(0) = 0$  and  $y(1) = 1$  can be extremised. [8]

b) Show that the functional  $\int_0^{\pi/2} [2xy + (\frac{dx}{dt})^2 + (\frac{dy}{dt})^2] dt$  such that  $x(0) = 0, x(\pi/2) = -1, y(0) = 0, y(\pi/2) = 1$  is stationary for  $x = -\sin t, y = \sin t$ . [8]

### SECTION-II

**Q6) a)** For the Bessel's function  $J_n(x)$ , prove the recurrence formulas that [6]

i)  $\frac{d}{dx}[x^{-n}J_n(x)] = x^{-n}J_{n-1}(x)$     ii)  $J'_n(x) = \frac{1}{2}[J_{n-1}(x) - J_{n+1}(x)]$

b) For Legendre's function  $P_n(x)$ , prove that [6]

i)  $(n+1)P_n(x) = (2n+1)xP_n(x) - nP_{n-1}(x)$

ii)  $nP_n(x) = xP_n'(x) - P_{n-1}'(x)$

c) Express  $J_5(x)$  in terms of  $J_1(x)$  and  $J_0(x)$  [4]

**Q7)** a) Assume inter-arrival time X service time Y are exponentially distributed with mean 3 and 2 min. respectively. Simulate the model for 10 minutes by using the following random variable. [8]

RN for X: 0.82 0.23 0.37 0.75 0.15 0.27

RN for Y: 0.66 0.31 0.48 0.92 0.38 0.72

b) In a shooting competition, the probability of a man hitting a target is  $2/5$ . If he fires 5 times, what is the probability of hitting the target. [4]

i) At least twice

ii) At most twice

c) The mean and the variance of the Binomial distribution are 6 and 2 respectively. Find  $P(x > 1)$  and  $P(x = 2)$ . [4]

**Q8)** a) Samples of 40 are taken from a lot, which is on the average 20% defective.

i) What is the probability that a sample of forty will contain exactly 11 defective.

ii) What is the probability that it will contain 11 or more defective? (Use normal distribution) [6]

b) Fit the binomial distribution to the set of following observations [5]

x: 0 1 2 3 4 5

f: 27 14 6 3 0 0

c) Fit the Poisson distribution to the following data and test the goodness of fit. [6]

x: 0 1 2 3 4

f: 112 73 30 4 1

**Q9) a)** Based on 15 subgroups each of size 200 taken at intervals of 45 minutes from a manufacturing process, the average defective was found to be 0.068. Construct p-chart and np-chart. **[6]**

b) From the data given below about the treatment of 250 patients suffering from a disease, state whether the new treatment is superior to the conventional treatment. **[5]**

	Favourable	Notfavourable
New:	140	30
Conventional:	60	20

c) A random sample of 200 screw is drawn from a population which represents a size of screws. If a sample is distributed normally with mean 3.15 cm and standard deviation 0.025 cm find the expected number of screws whose size falls between 3.12cm and 3.2cm. It is given that  $z_1 = -1.2$ ,  $A_1 = 0.3849$  and  $z_2 = 2.0$ ,  $A_2 = 0.4772$ . **[5]**

**Q10)a)** Test whether the following Morcov chain (transition matrix) is ergodic or regular. **[8]**

$$\begin{bmatrix} \frac{1}{4} & \frac{1}{4} & \frac{1}{2} \\ \frac{1}{4} & \frac{3}{4} & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \end{bmatrix}$$

Construct the state diagram also.

b) Find the steady state probabilities and mean recurrence time for the following Marcov chain. **[9]**

$$\begin{bmatrix} 0.5 & 0.3 & 0.2 \\ 0.2 & 0.4 & 0.4 \\ 0.1 & 0.5 & 0.4 \end{bmatrix}$$



Total No. of Questions :10]

SEAT No. :

**P4513**

**[4860] - 287**

[Total No. of Pages :2

**M.E. (Production Engg.)**  
**ADVANCE MANUFACTURING PROCESSES**  
**(2008 Course) (Semester - I) (511103)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from each section.*
- 2) *Question 5 & Question 10 are compulsory.*
- 3) *Answers to the two sections should be written in separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Assume suitable data, if necessary.*
- 6) *Figures to the right indicate full marks.*
- 7) *Use non-programmable electronic calculator is allowed.*

**SECTION-I**

- Q1)** a) State the types of casting and compare their advantages and limitations in brief. [8]  
b) Explain the most significant design considerations in casting design. [8]
- Q2)** a) Explain shrinkage allowance & machining allowance in casting. [8]  
b) Explain the solidification of weld metal. [8]
- Q3)** a) Explain various major discontinuities appearing in weld joints which affect weld quality. [8]  
b) Describe the destructive techniques of testing welded joints. [8]
- Q4)** a) Explain Molecular Dynamic Analysis process in machining. [8]  
b) Explain principle of working of Electro Chemical Machining process and state the applications. [8]
- Q5)** Write short note on following (Any three) [18]  
a) Inspection of castings.  
b) Heat Affected Zone(HAZ) in Welding.  
c) Laser Beam Machining.  
d) Gating system design.  
e) Ballistic Machining.

*P.T.O.*



## SECTION-II

- Q6)** a) What is the significance of anisotropy? [8]  
b) Write a note on slip line field theory in forming process. [8]
- Q7)** a) Explain the principle of magnetic pulse forming? State the applications of the same. [8]  
b) Explain the process of peen forming. [8]
- Q8)** a) Explain the characteristics of metals important in Sheet forming. [8]  
b) What is mean by spinnability? Explain conventional & shear spinning with suitable sketch. [8]
- Q9)** a) Explain With suitable figure stretch-forming process. What materials are used for dies in stretch forming? [8]  
b) Explain the process of High speed blanking. State its applications. [8]
- Q10)** Write short notes on (Any three) [18]  
a) Methods of bending tubes.  
b) Cupping test of formability.  
c) Explosive forming.  
d) Extrusion process.  
e) Ironing process.

**x      x      x**

Total No. of Questions : 8]

SEAT No. :

P3967

[4860] - 29

[Total No. of Pages : 2

**M.E. (Civil) (Hydraulics)**

**HYDROLOGY**

**(2008 Pattern)**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Write a note on artificial rainfall. [8]  
b) Following are the ordinates of 4-hour unit hydrograph. Derive the ordinates of 8-hour unit hydrograph without S-curve method. [8]

Time(hr)	0	4	8	12	16	20	24	28	32	36	40	44
4-hr UGO (cumec)	0	24	82	159	184	151	103	64	36	17	6	0

- Q2)** a) Write a short note on Risk, Reliability and Safety Factor. [8]  
b) Explain in detail infiltration indices. [8]

- Q3)** a) What is meant by 'Return Period'? How it is decided depending upon type of project? [8]  
b) Explain Log-Pearson type III distribution. [8]

- Q4)** Write short notes on : [18]  
a) Base flow separation.  
b) Gumbel's method.  
c) Minimum density of rain gauge stations.

**P.T.O.**

## SECTION - II

- Q5)** a) A tube well taps an artesian aquifer. Find its yield in liters per hour for a drawdown of 5 m when the diameter of the well is 20 cm and the thickness of the aquifer is 50 m. assume the coefficient of permeability to be 30 m/day. Assume the radius of influence as 250 m. [8]  
b) Write a note on interference of wells. [8]
- Q6)** a) Write a note on sea water intrusion. [8]  
b) Briefly explain the precautionary measures to minimize salinity. [8]
- Q7)** a) Explain seepage characteristics of surface water. [8]  
b) Write a note on ground water budget. [8]
- Q8)** Write short note on : [18]  
a) Method of images.  
b) Cone of depression.  
c) Artificial recharge of groundwater.



Total No. of Questions :12]

SEAT No. :

**P4514**

**[4860] - 291**

[Total No. of Pages :3

**M.E. (Production) (Mfg and Automation)  
d - ADVANCED MACHINE TOOL DESIGN  
(2008 Revised Course) (Semester-I) (511104) (Elective-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Attempt one question from each unit of Section I and Section II respectively.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of non-programmable electronic pocket calculator and statistical tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION-I**

**UNIT-I**

- Q1)** a) Discuss briefly the salient features to be considered for selecting and designing a suitable drive system in a machine tool. [8]
- b) Develop a generalized empirical relationship for the thrust and torque in drilling and compare the same with turning to validate Optiz's hypothesis that the principles of cutting mechanism fall into the same category. [10]

OR

- Q2)** a) Find out the method of differentiating a special purpose machine from a general-purpose machine based on the kinematic structure. [6]
- b) Draw the speed ray diagram (compromise gear box) having 6 speed in the upper range and 8 speeds in the lower range. The spindle speed ranges from 2600 to 180 rpm. What are the advantages and limitations of such compromise gear box? [12]

**UNIT-II**

- Q3)** a) Explain the method of evaluating the stiffness and natural frequency of vibration of a machine tool bed having two-tier cross-section with stiffeners, using Krylov's function. State the final expression for frequency of vibration. [8]
- b) Discuss the method of designing a horizontal circular table of a vertical boring machine, where the cylindrical workpiece is clamped. Average diameter of the guide is  $d$  and the width of the guide is  $b$ . [8]

OR

**P.T.O.**

- Q4)** a) Discuss the importance of following elements in spindle design: [8]  
i) Diameter of front journal bearing.  
ii) Additional spindle support.  
iii) Location of bearing and drive element.  
iv) Balancing.
- b) Analyze the load taken by the balls in a ball bearing used as a spindle support and show that due to contact deformation not more than 80% of the balls take the entire thrust. [8]

### UNIT-III

- Q5)** a) What is meant by regenerative chatter? Explain it with reference to turning center. [8]  
b) Draw the hydraulic circuit for obtaining forward as well as quick return motion of a shaping machine. Indicate all the parts and elements and describe briefly their characteristic functions. [8]

OR

- Q6)** a) Discuss with neat sketch the feed gearbox, operated by Tumbler gears. Show three positions; forward, neutral and reverse. [8]  
b) With neat sketches of circuit diagrams show the functioning of a thermal relay and an electrical braking system. [8]

### SECTION-II

#### UNIT-IV

- Q7)** a) Explain with a neat sketch the built-in auto inspection system used in cylindrical grinding machine for measuring the outside diameter. [8]  
b) What procedure is used by the operator to determine the tool length and zero offsets? [8]

OR

- Q8)** a) What are the various types of transducers commonly used in a CNC machine? Explain the functioning of linear transducer and angular transducer. [8]  
b) Explain with neat sketches the five basic types of tool changers? [8]

#### UNIT-V

- Q9)** a) 'It is necessary to have high damping coefficient and large stiffness of the tool to reduce vibration'-Discuss the statement giving specific example of a turning operation. [8]

- b) Explain with suitable example dynamic characteristic of the cutting process. [10]

OR

- Q10)a)** Enumerate the various methods, used in practice to reduce the positional displacement error due to 'Stick Slip'. [8]

- b) With suitable sketches explain the procedure followed in performing acceptance tests on vertical machining center. [10]

**UNIT-VI**

- Q11)a)** What is the role of aesthetics in the design of modern machine tools?[8]

- b) Explain the concept of matrices in the design of layout of machine tools with a suitable example. [8]

OR

- Q12)a)** Discuss the advantages of retrofitting in building machine tools. [8]

- b) Justify the techniques that can be applied in the design of machine tool structures for micro machining applications. [8]

**x x x**

Total No. of Questions : 8]

SEAT No. :

**P4101**

[Total No. of Pages : 2

**[4860]-292**

**M.E. (Production Engineering) (Semester - I)**

**ADVANCE ROBOTICS (Elective - II)**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Define Industrial Robot. Explain Robot anatomy with the help of neat figure. **[10]**
- b) State and explain in brief the recent industrial applications of Robot. **[8]**
- Q2)** a) Explain the Direct kinematics associated with planar 3R manipulator. **[8]**
- b) Explain the Inverse kinematics associated with planar 3R manipulator. **[8]**
- Q3)** a) Explain the force analysis in gripper system. **[8]**
- b) Why controls are required in Robot? Explain different types of controls used in Robot. **[8]**
- Q4)** a) Classify the types of grippers used in robots. Describe any one type of gripper in detail. **[8]**
- b) Explain in brief non- optical and optical position sensors. **[8]**

**P.T.O.**

## **SECTION - II**

- Q5)** a) Explain in brief the programming methods used in robotics. [10]  
b) Why there is a need of Sensor? Explain Force and Torque sensors used in robot with neat sketch. [8]
- Q6)** a) What is machine vision system in Robot? Explain various steps of processing the image in Robotic Vision System. [8]  
b) What is the function of a range sensor in the robot work cell? Explain various range sensing techniques. [8]
- Q7)** a) Explain Degree of freedom (DOF), Mobility and DH parameters in brief with suitable example. [8]  
b) Explain the classification of closed- and open-loop kinematic systems. [8]
- Q8)** a) What is Jacobian Matrix? Explain the role of Jacobian matrix in the path control strategy. [8]  
b) Compare Newton-Euler and Lagrange-Euler formulations and situations when you will prefer NE formulations/ LE formulations. [8]





Total No. of Questions : 8]

SEAT No. :

P4102

[Total No. of Pages : 2

[4860]-293

M.E. (Production) (Semester - I)

SHEET METAL PROCESSING (Elective - II (b))

(2008 Pattern)

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any three questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn whenever necessary.*

**SECTION - I**

- Q1)** a) Discuss with suitable example that how forming lines is considered. [8]  
b) Discuss different methods for testing of sheet metal product. [8]
- Q2)** a) Explain different defects and their remedies for the parts drawn by press work. [8]  
b) Describe various steps to be followed from the product design stage to the finished product while manufacturing in a small quantity, a small pot of Aluminum sheet. [8]
- Q3)** a) Discuss the different criteria for selection of a press tools. [8]  
b) Explain safety concept in press working. [8]
- Q4)** Write short notes on any three: [18]  
a) Forming limit diagram.  
b) Different properties and grades for sheet metal.  
c) Fine blanking.

**P.T.O.**

**SECTION - II**

- Q5)** a) Explain with neat sketch a hydro forming and its process parameters. [8]  
b) Compare three and two high rolling. [8]
- Q6)** a) Explain different drive systems used in presses used for sheet metal. [8]  
b) Explain different devices used for handling of pressed out parts. [8]
- Q7)** a) Explain with suitable example how modeling is done of a sheet metal component. [8]  
b) Explain with suitable example how CAM is used in sheet metal forming metal forming with suitable example. [8]
- Q8)** Write short notes on any three: [18]  
a) Selection criteria for presses.  
b) Press Brakes.  
c) Strain distribution of a drawn component.



Total No. of Questions :8]

SEAT No. :

**P4515**

**[4860]-294**

[Total No. of Pages : 3

**M.E. (Production - Manufacturing & Automation)**

**c - TOOL & DIE DESIGN**

**(Elective - II) (2008 Course) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

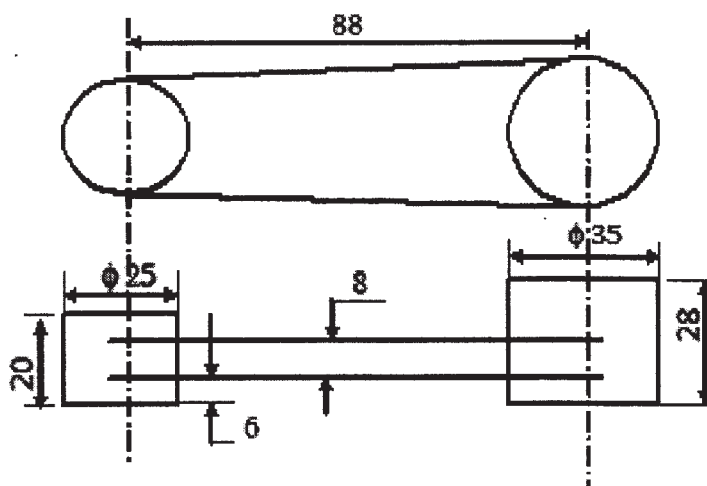
- Q1)** a) In orthogonal cutting process rake angle =  $6^\circ$ , width of the cut = 10 mm, undeformed chip thickness = 0.2 mm, If 13.36 gm of steel chip with total length 500 mm are obtained. What is slip plane angle ?  $\rho = 7830 \text{ kg/m}^3$ . **[8]**
- b) Explain the effect of end cutting edge angle on amplitude of chatter. **[8]**
- Q2)** a) Explain with neat sketches various principles of location in jigs and fixtures. **[8]**
- b) Explain with suitable example the applications of equalizers. **[8]**
- Q3)** a) With neat sketch explain **[10]**
- i) Spring strippers.
- ii) Ejection knockouts.
- b) Determine the shear angle to punch  $\phi$  10 mm hole in 2 mm thick sheet in order to reduce the cutting force by 20% of that without shear. Assume shear stress of sheet material to be 120 MPa. **[6]**
- Q4)** a) Derive expression for temperature rise along primary and secondary cutting zone of a cutting tool. **[9]**
- b) What is use of diamond pin? How the width of diamond pin can be calculated ? **[9]**

**P.T.O.**

## SECTION - II

**Q5) a)** A component to be forged is as shown in Figure below. Determine :

- i) Parting line location. [2]
- ii) Stock size. [5]
- iii) Flash dimensions. [3]



b) Explain rules for upset forging. [6]

**Q6) a)** Calculate the amount of cooling water to be circulated for cooling the injection mold for the component having following data: Injection temperature of plastic = 210 °C, temperature at the end of solidification = 85°C, Specific heat capacity of plastic 3.72 kJ/ kg°C, weight of plastic component = 308 gm. Cycle time for component = 28 sec., Incoming water temperature 208C, Outgoing water temperature : 358C, Specific heat capacity of water: 4.2 kJ/kg°C. [8]

b) For injection molding of a component having shot weight 170 gm, determine the number of impressions for minimum cost. Shot weight handling capacities for various injection molding machines along with machine hour rate is as given below: [8]

Capacity (kg)	0.5	1	1.3	1.5
Machine hour rate (Rs)	200	270	380	450

Given that,

- i) Material = PVC (Density 1.3 gm/ cm<sup>3</sup>)
- ii) Quantity to be produced = 20 lakh.
- iii) Cycle time = 35 seconds.
- iv) Cost of producing one impression = 2500 Rs.

**Q7)** a) Explain various types of dies used in die casting. [8]

b) Explain various defects in die casting. [8]

**Q8)** Write short notes on: [18]

a) Determination of mold opening force in injection molding.

b) Design aspects of edging impression in forging die.

c) Types of gates in injection mold.



Total No. of Questions : 8]

SEAT No. :

**P4103**

[Total No. of Pages : 2

**[4860]-296**

**M.E. (Production) (Manufacturing automation)**

**MATERIAL TECHNOLOGY**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Attempt any three questions from each section*
- 2) *Answers to the two sections should be written in separate sheet.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks*
- 5) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain with neat sketch mechanisms of plastic deformation of crystalline materials. **[8]**
- b) Describe strengthening mechanisms used for metals. **[8]**
- Q2)** a) Describe the role of inclusions in ductile fracture and initiation of a fatigue crack in smooth and notched specimens. **[8]**
- b) Describe the possible effects of a peak load on the crack growth behaviour during variable amplitude fatigue. **[8]**
- Q3)** a) Explain with examples four basic steps in the procedure of material selection. **[8]**
- b) What are the responsibilities of 'Materials Engineer' in the context of selection proper materials? **[8]**

**P.T.O.**

- Q4)** a) Describe with neat sketch creep plastic deformation mechanism of a material at high temperatures. [6]
- b) What is meant by: [6]
- i) The stress concentration factor?
- ii) The stress intensity factor?
- iii) The critical stress intensity factor?
- c) How do we go about selecting a material for a given auto part? [6]

**SECTION - II**

**Q5)** Describe characteristics, advantages, disadvantages and applications of following:

- a) Dual phase (DP) steels [6]
- b) High strength low alloy (HSLA) steels [5]
- c) Transformation induced plasticity (TRIP) steel [5]

**Q6)** a) Which are the natural non-metallic materials? Explain the basic properties and some typical applications of the natural non-metallic materials. [8]

b) List out basic properties and typical applications of CBN and diamond. [8]

**Q7)** a) What are composites? Show the relationship between conventional materials and composites. [8]

b) Give the properties, advantages, disadvantages and applications of different reinforcing fibers. [8]

**Q8)** a) Why to use composite materials? Suggest some areas of applications with product name where composites are preferred than metals. [6]

b) Write note on:

i) Metallic glasses [6]

ii) Advanced structural Ceramics [6]



Total No. of Questions : 12]

SEAT No. :

**P4104**

[Total No. of Pages : 3

**[4860]-297**

**M.E. (Production Engineering)**

**MANUFACTURING MANAGEMENT**

**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

**UNIT - I**

- Q1)** a) What is quality revolution? Discuss the scope of it in detail. [8]  
b) Discuss what division of labor is. Explain in detail with example. [10]

OR

- Q2)** a) "Nature of Manufacturing management plays an important role in system of manufacturing", comment. [8]  
b) Discuss contribution of any two pioneers in manufacturing management. [10]

**UNIT - II**

- Q3)** a) Explain any four functions of Production Planning and Control. [8]  
b) What is crashing of network? Describe with a good example. [8]

OR

**P.T.O.**



- Q4)** a) What do you mean by scheduling techniques? Discuss any one in brief. [8]  
b) Discuss the procedure to create the production work order. [8]

**UNIT - III**

- Q5)** a) What are the manufacturing challenges of information age? [8]  
b) What is reconfigurable manufacturing? How is it useful for a manufacturing manager? [8]

OR

- Q6)** a) Discuss the importance of green production from manufacturing management perspective. [8]  
b) Write a note on agile manufacturing. [8]

**SECTION - II**

**UNIT - IV**

- Q7)** a) Describe Organizational commitment in detail. [6]  
b) Explain autocratic and custodial model of organizational behavior. [12]

OR

- Q8)** a) Describe the historical background of organizational behavior. [9]  
b) Explain autocratic and custodial model of organizational behavior. [9]

**UNIT - V**

- Q9)** a) Define morale and explain its relationship with productivity. [8]  
b) Discuss Herzberg's theory of job loading. [8]

OR

- Q10)** a) Describe characteristics of motives. [8]  
b) Define leadership and explain its significance from manufacturing management perspective. [8]

**UNIT - VI**

- Q11*)a) Discuss theory of group formation in brief. [8]  
b) Write a short note on stress management. [8]

OR

- Q12*)a) Discuss the strategies for encouraging constructive conflict. [8]  
b) Differentiate between formal and informal groups. [8]



Total No. of Questions :8]

SEAT No. :

**P4516**

**[4860]-298**

[Total No. of Pages : 3

**M.E. (Production - Manufacturing & Automation)**

**INDUSTRIAL AUTOMATION**

**(2008 Course) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Answer any three questions from each section.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right side indicate full marks.*
- 5) Use of calculator is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

- Q1) a)** A single station robotic assembly system performs a series of five assembly elements, each of which adds a different component to a base part. Each element takes 4.5 sec. In addition , the handling time needed to move the base part into and out of position is 4 sec. For identification, the components , as well as the elements that assemble them, are numbered 1,2,3,4, and 5. The fraction defect rate is 0.005 for all components , and the probability of a jam by a defective component is 0.7. Average downtime per occurrence = 2.5 min. **[10]**

Determine

- i) Production rate.
  - ii) Yield of good product in the output.
  - iii) Uptime efficiency, and
  - iv) Proportion of the output that contains a defective type 3 component.
- b) Explain difference between upper bound and lower bound approach of determining frequency of breakdown of an assembly line. **[6]**

***P.T.O.***

**Q2) a)** For a swash plate type of pump following data operates : **[8]**

- Number of Pistons = 6
- Piston diameter = 25 mm
- Pitch circle diameter of the cylinder = 180 mm.
- Input power = 8 KW.
- Volumetric efficiency = 90%
- Mechanical efficiency = 89.

Calculate theoretical pump displacement and angle of swash plate if maximum pressure and speed at which pump operates is 200 bar and 1000 rpm respectively.

b) Draw hydraulic circuit showing the application of counterbalance valve and explain its working. **[8]**

**Q3) a)** Draw a Pneumatic circuit to actuate the cylinder if sensors C and D are in the same state (ON or OFF) as that of sensor B and sensor A is in opposite state. **[8]**

b) Draw a Pneumatic circuit using cascade method to actuate the two cylinders in following sequence : **[8]**

- i) Cylinder 1 and 2 extends simultaneously.
- ii) Cylinder 2 retracts.
- iii) Cylinder 3 extends and Cylinder 1 retracts simultaneously.
- iv) Cylinder 3 retracts.

**Q4)** Write short notes on : **[18]**

- a) Transfer line monitoring systems.
- b) Fluidic AND/OR gate.
- c) Use of Pressure reducing valves to maintain fixed pressure difference.

## SECTION - II

- Q5)** a) Write a 8085 microprocessor program to clear the accumulator , add 27H, subtract 45H, add 6CH, display the result at output port. [8]  
b) Explain the operation of PLC with suitable sketch. [8]
- Q6)** a) Derive an expression for the limiting velocity of escapement of the cylindrical workpiece through a slot. [8]  
b) Explain in detail synchronous and non synchronous material transfer with suitable example. [8]
- Q7)** a) Explain important functions of a work cell controller in an industrial robot. [8]  
b) What is Linear feedback control system? Explain with suitable example.[8]
- Q8)** Write short notes on: [18]  
a) Use of counters in PLC.  
b) Robot programming languages.  
c) Use of sign flag in microprocessor.



Total No. of Questions : 10]

SEAT No. :

P4105

[Total No. of Pages : 3

[4860]-299

M.E. (Production)

PLASTIC PROCESSING (Eective - III)

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate answer books.
- 2) Answer any three questions from each section.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.
- 5) Use of calculator is allowed.
- 6) Assume Suitable data if necessary

**SECTION - I**

- Q1)** a) Explain in details classification of plastic materials. [8]
- b) Explain the characteristics of some important plastics any two. [8]
- Q2)** a) Explain general features of twin screw extruder. [8]
- b) Explain with neat sketch basic elements of single screw extruder. [8]
- Q3)** a) A cylindrical vessel with an outside radius of 40 mm and inside radius of 20 mm has a radial crack 3.5 mm deep on the outside surface. If the vessel is made from polystyrene which has a critical stress intensity factor of  $1.05 \text{ MNm}^{-3/2}$ , calculate the maximum permissible pressure in this vessel. [8]
- b) Develop a mathematical model of visco-elastic behaviour for Kelvin Model. [8]

P.T.O.

- Q4)** a) Explain with respect to injection moulding functions of: [8]  
i) Sprue bush  
ii) Cavity and cores  
b) Explain different types of ejector grid in injection molding [8]

- Q5)** a) Explain different polymerization techniques. [9]  
b) Explain constructional features:  
i) Core and cavity plates.  
ii) Mold size and strength  
iii) Mold placements [9]

### **SECTION - II**

- Q6)** a) A blow moulding die has an outside diameter of 32 mm and an inside diameter of 28 mm. The parison is inflated with a pressure of 0.45 MN/m<sup>2</sup> to produce a plastic bottle of diameter 50 mm. If the extrusion rate used causes a thickness swelling ratio of 2, estimate the wall of the bottle. Comment on the suitability of the production conditions if melt fracture occurs at a stress of 6 MN/m<sup>2</sup>. [8]  
b) Derive an expression for analysis of flow in Extruder with reference to drag flow and pressure flow. [8]
- Q7)** a) Explain how will you avoid warpage with specific reference to part design and mold design. [8]  
b) Explain with neat sketch typical expandable polystyrene molding operation for storage of in-coming materials. [8]
- Q8)** a) Explain different devices for temperature. [8]  
b) Explain the processing techniques for thermoplastics. [8]

- Q9)** a) Explain steel molds for plastics with reference to size factor and inherent quality. [8]
- b) Explain the applications for electroforming. [8]

**Q10)** Write short notes on: [18]

- a) Temperature control of injections molds
- b) Injection molding of thermosets
- c) Aluminium molds
- d) Design of gating system
- e) Software's for mold flow analysis.





Total No. of Questions : 8]

SEAT No. :

**P4446**

[4860] - 3

[Total No. of Pages : 2

**M.E. (Civil) (Construction and Management)**  
**CONSTRUCTION TECHNOLOGY**  
**(2008 Course) (Semester - I) (501103)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any three questions from Section - I and any three from Section - II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat and clean diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the procedure of construction of under deep water-concrete diaphragm walls. [8]  
b) What are the different methods of underwater concreting? Explain any one method with sketches. [8]
- Q2)** a) What are the different grouting methods? Explain the chemical grouting. [9]  
b) Comment on the problems encounter in the underwater concreting. [9]
- Q3)** a) What is vacuum dewatering by electro-osmosis? Explain installation and operation of deep well point system of dewatering. [8]  
b) What is Polymerization technique? Write a note on its applications and limitations. [8]
- Q4)** Write a short note on any four of the following: [16]  
a) Precautions in use of concrete pumps.  
b) Resin grouting technique.  
c) Pre-packed concrete.  
d) Merits and demerits of RMC (Ready Mix Concrete).  
e) Enlist the methods of shuttering.

**P.T.O.**

## SECTION - II

- Q5)** a) Give the classification of piles based on: **[10]**
- i) Mechanism of load transfer.
  - ii) Method of installation.
  - iii) Type of material used.
- State the advantages and disadvantages of prestressed piles.
- b) Comment on pile driving methods. **[6]**
- 
- Q6)** a) What are the micro piles give their applications? **[9]**
- b) A circular cofferdam of 11m diameter was proposed wherein following options were considered for method of construction.
- i) R.C.C. diaphragm wall 60cms. thick.
  - ii) Interlocking circular piles of 800mm dia.
- Select any one of the above giving its advantages over the other. **[9]**
- 
- Q7)** a) What are the different types of cofferdam? What are the factors to be considered for construction of Sheet pile cofferdams? **[8]**
- b) What are the different types of caissons? Explain any one with sketch. **[8]**
- 
- Q8)** Write a notes on any four of the following: **[16]**
- a) Accelerated curing methods in high rise buildings.
  - b) Single acting hammers in driven piles.
  - c) Large diameter piles.
  - d) Friction piles.
  - e) Precautions to be taken for pump concrete for high rise buildings.



Total No. of Questions : 8]

SEAT No. :

**P4457**

**[4860]-30**

[Total No. of Pages : 2

**M.E. (Civil) (Hydraulics)**

**SEDIMENT TRANSPORT AND RIVER MECHANICS**

**(2008 Course) (Semester-II) (501310)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any three questions from each section.*
- 2) *Figures to the right indicates full marks.*
- 3) *Use of scientific calculator is allowed.*
- 4) *Assume suitable data if necessary.*

**SECTION-I**

**Q1) a)** Define sediment, Enlist the nature of sediment problems and Discuss any five in detail. **[10]**

b) How the form resistance and grain resistance vary in different flow regimes? **[8]**

**Q2) a)** Draw neat sketches showing the flow regimes considering changes in flow conditions and explain it. **[10]**

b) What do you mean by bed load, contact load and wash load? Distinguish between bed load and contact load. **[6]**

**Q3) a)** Use Meyer-Peter and Muller equation for bed load transport of sediment in an alluvium channel with following data. **[10]**

- i) width = 100 m
- ii) discharge = 200 m<sup>3</sup>/s
- iii) depth of water = 4 m
- iv) bed slope of channel = 1 in 5000
- v) mean size of sediment particle = 3 mm

b) Define fall velocity & derive equation for it. **[6]**

**Q4) a)** Explain Dubuoy's bed load equation for prediction of bed load transport rate. **[10]**

b) Water flows at a depth of 0.40 m in a wide rectangular channel with bed slope 1 in 1200. The average diameter of sand grain in the channel bed is 1 mm. Comment on whether the grains are stationary or in motion? **[6]**

**P.T.O.**

## SECTION-II

- Q5)** a) Compare Kennedy method and Lacey method for the design of an irrigation channel. Also Design an irrigation channel in alluvial soil according to Lacey's method for following data. **[12]**
- i) Full supply discharge:  $50 \text{ m}^3/\text{sec}$
  - ii) Lacey's silt factor  $-0.9$
  - iii) Channel side slope  $0.5\text{H}:1\text{V}$
- b) How will you determine the sediment load by remote sensing? Discuss in brief. **[6]**
- Q6)** a) On the basis of hydraulic aspect explain the phenomenon of aggradations & degradation. **[8]**
- b) Explain the various methods for controlling the sedimentation of reservoirs. Also mention the effectiveness of each measure for sediment control. **[8]**
- Q7)** a) What is river gauging? Explain the methods of river gauging in detail. **[8]**
- b) In context with river morphology explain the terms bifurcation and confluences. **[8]**
- Q8)** a) Explain the types of classification of river training works. **[8]**
- b) Define & explain briefly: **[8]**
- i) Meander length.
  - ii) Meander belt.
  - iii) Delta formations.
  - iv) Tortuosity.



Total No. of Questions : 8]

SEAT No. :

**P4106**

[Total No. of Pages : 2

**[4860]-300**

**M.E. (Production) (Semester - II)**

**PRODUCT LIFE CYCLE MANAGEMENT (Elective - III)**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer Three questions from Section-I and Three questions from Section-II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data if necessary.*
- 6) *Use of electronic pocket calculator is allowed.*

**SECTION - I**

- Q1)** a) Explain various phases of product life cycle considering any automobile industry. [8]  
b) Explain the main drivers of PLM. [8]
- Q2)** a) Explain PLM Strategies and how these strategies are implemented. [8]  
b) Explain PDM system architecture. [8]
- Q3)** a) Classify and explain the types of products. [8]  
b) Explain 'Kansei Engineering' of for the design of product. [8]
- Q4)** Write short note on. [18]  
a) PLM feasibility study.  
b) Barriers to PDM implementation.  
c) Customers role in product life cycle.

**P.T.O.**

## SECTION - II

- Q5)** a) Explain and differentiate between Engineering design and industrial design with suitable example. [8]  
b) Explain product line with suitable example. [8]
- Q6)** a) Explain steps to design a product. [8]  
b) Explain Concurrent Engineering. [8]
- Q7)** a) Explain Technology forecasting. [8]  
b) Explain Quality Function deployment. [8]
- Q8)** Write short note on
- a) Design for Reliability [6]  
b) Design for Assembly [6]  
c) Use of computer in product design [6]



Total No. of Questions : 12]

SEAT No. :

**P4107**

[Total No. of Pages : 3

**[4860]-301**  
**M.E. (Production)**  
**WELDING & JOINING**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Your answers will be valued as a whole.*
- 6) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 7) *Assume suitable data, if necessary.*

**SECTION - I**

**UNIT - I**

- Q1)** a) Explain what is HAZ in welding? Explain subdivisions of HAZ for low carbon steel welds and show their corresponding temperature ranges on an iron- carbon equilibrium diagram. **[9]**
- b) Explain how welding and allied processes are classified? Give sub classifications also. **[9]**

OR

- Q2)** a) Define weldability. What are the different tests carried out to estimate "weldability" of a metal? Explain the effect of alloying elements on "weldability". **[9]**
- b) With the help of figure explain cellular and dendritic growth patterns and the manner of solute distribution (ie. segregate pattern) in case of weld solidification. **[9]**

**P.T.O.**

## UNIT - II

- Q3)** a) Explain different types of welding Arcs. [8]  
b) Explain the importance of selection of polarity in electric Arc Welding? How polarity is selected? [8]

OR

- Q4)** a) What are the different methods of arc initiation and maintenance? [8]  
b) Discuss the influence of microstructure on fatigue cracking of stainless steel welds. [8]

## UNIT - III

- Q5)** a) Discuss an Arc instability caused by DC component in AC TIG welding. [8]  
b) What is deposition rate? Compare deposition rates with hot wire and cold wire GTAW process. [8]

OR

- Q6)** a) Explain the methods to improve metallurgical properties of elroslag welds. [8]  
b) Discuss the effect of stainless steel Manual Metal Arc Welding (MMAW) fume on human brain & free radical production. [8]

## SECTION - II

### UNIT - IV

- Q7)** a) What are the basic characteristics required for Arc welding power sources? Explain different factors that influence selection of power sources. [8]  
b) Explain what is "Duty cycle" in brief. [8]

OR

- Q8)** a) What are the different types of rectifiers used in welding? Explain any one in brief. [8]  
b) Explain how arc length is controlled in mechanised welding process. [8]



### UNIT - V

- Q9)** a) Explain in brief the different modes of metal transfer in welding process. [8]  
b) Explain metal transfer in SMAW process. [8]

OR

- Q10)** a) With the help of graph explain "Droplet transfer frequency for steel with different welding processes". [8]  
b) What is weld penetration shape factor and weld Ripples in case of metal transfer in welding. [8]

### UNIT VI

- Q11)** a) Explain cold welding process in detail. [9]  
b) Describe the principle of operation of "Ultrasonic welding process" with merits & demerits. [9]

OR

- Q12)** a) Explain steps in friction welding. Also explain welding variables in friction welding. [9]  
b) Explain Electron Beam welding system in brief. Compare high and low voltage electron guns used in Electron Beam Welding. [9]



Total No. of Questions : 8]

SEAT No. :

**P4108**

[Total No. of Pages : 2

**[4860]-302**

**M.E. (Production) (Semester - II)**

**SURFACE TREATMENT PROCESSES (Elective - III)**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Solve any three questions from each section*
- 2) Answer to the two sections should be written in separate books*
- 3) Figures to the right indicate full marks*
- 4) Neat diagrams must be drawn whenever necessary.*

**SECTION - I**

- Q1)** a) Compare scope of surface engineering of metal and nonmetal. [8]  
b) Explain role of surface dependent properties in assembly of parts in a product. [8]
- Q2)** a) Explain the necessity of surface cleaning before post treatment on surface. [8]  
b) Explain with neat sketch CVD surface coating processes. [8]
- Q3)** a) Explain various methods of improving mechanical properties of metal. [8]  
b) Discuss Carbon thin film coating. [8]
- Q4)** Write short notes on any three: [18]  
a) Mechanism of surface degradation.  
b) Pickling and descaling.  
c) Salt bath surface cleaning process.

**P.T.O.**

## SECTION - II

- Q5)** a) Explain with neat sketch and controlling parameter for obtaining desired thickness of Coating in Thermal spray method. [8]
- b) Discuss different factors in manufacturing processes affect on various surface properties of engineering parts. [8]
- Q6)** a) Explain different ways for evaluation of surface geometry. [8]
- b) Explain the following with respect to coated surface of engineering material
- i) Response properties
  - ii) Surface geometry [8]
- Q7)** a) Explain use of laser in surface engineering. [8]
- b) What is meant by Nano scale? Explain how it will be achieved. [8]
- Q8)** Write short notes on any three: [18]
- a) Ion Implantation
  - b) surface engineering problems
  - c) different methods to measure thickness of coating



Total No. of Questions :8]

SEAT No. :

P4517

[4860]-303

[Total No. of Pages : 2

**M.E. (Production - Manufacturing and Automation)**  
**a - OPTIMIZATION TECHNIQUES**  
**(2008 Course) (Semester - II) (Elective - IV) (Open)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1) a)** A cylindrical shell of heat exchanger is to be designed so as to accommodate a total of 100 m length of copper tubes . Cross sectional area of 1 m<sup>2</sup> inside the shell can accommodate 200 copper tubes. Formulate an optimization problem with objective of minimizing cost of heat exchanger if cost of copper tubes Rs.20000,cost of heat exchanger shell is Rs. 60000×D<sup>2.5</sup>×L Cost of floor space occupied by heat exchanger shell is Rs. 10000×D×L Where , D= diameter of heat exchanger shell and L is length of heat exchanger shell. **[8]**
- b) Explain applications of optimization techniques in production engineering. **[8]**
- Q2) a)** Minimize the function  $f(x) = 2x^4 + 4x^3 - 15x^2 + 8$  using golden section method within the bounds of 0 to 2. **[8]**
- b) Explain steps for Newton - Raphson method and also draw its flow chart. **[8]**
- Q3) a)** Perform two iterations of evolutionary optimization method to Minimize the function  $f(x) = x_1^2 - 5x_1 + x_2^2 - 3x_2 - 10$  such that  $1 \leq x_1, x_2 \leq 5$  Consider starting point as  $x_1 = 2$  and  $x_2 = 3$  **[8]**
- b) Write the algorithm and draw flowchart for steepest descent method.**[8]**

**P.T.O.**

**Q4)** Write short notes on : **[18]**

- a) Secant method.
- b) Hessian matrix of a function.
- c) Multi-objective optimization.

**SECTION - II**

**Q5) a)** Perform two iterations of generalized reduced gradient method to minimize  $f(x) = x_1^2 + 2x_2^2$  subject to  $g(x) = 1 - x_1 - x_2 \leq 0$ . Consider starting point as  $x_1 = 2$  and  $x_2 = 4.5$ . **[8]**

b) Explain the gradient projection method for constrained optimization problems. **[8]**

**Q6)** Solve following integer programming problem. **[16]**

Minimize  $f(x) = -3x_1 - 4x_2$

Subject to following constraints :

$3x_1 - x_2 + x_3 = 12; 3x_1 + 11x_2 + x_4 = 66; \text{all } x_i \geq 0 \text{ and interger.}$

**Q7) a)** What is the probability of accepting new solution (2.4,3.1) over current solution of (1.8,2.6) at temperature 300°C for minimizing the function  $x_1^2 + 3x_2^2 - 8x_1x_2 + 360$  with  $1 \leq x_1, x_2 \leq 4$  using simulated annealing? **[8]**

b) Explain with suitable example 'Pareto optimal solutions' **[8]**

**Q8)** Write short notes on: **[18]**

- a) Two point crossover in genetic algorithm.
- b) Limitations of Simulated annealing method.
- c) Geometric programming.



Total No. of Questions : 8]

SEAT No. :

**P4109**

[Total No. of Pages : 3

**[4860]-304**

**M.E. (Production-Manufacturing & Automation)**

**RESEARCH METHODOLOGIES**

**(2008 Pattern) (Elective - IV (b))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer three questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of non-programmable electronic calculators is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Briefly describe the steps involved in research process. [6]  
b) What are the responsibilities of a researcher and his team members? [5]  
c) Describe different research approaches used by the researchers in India [5]
- Q2)** a) Explain and illustrate the process of selecting a random sample. [6]  
b) What is research design and what is its significance? [5]  
c) Point out the possible sources of errors in measurement. What are the tests of sound measurement? [5]
- Q3)** a) What problems of secondary data quality must researchers face? How can they deal with them? [6]  
b) Distinguish between structured, semi-structured and unstructured interviews. [5]  
c) What are the guiding considerations in the construction of a questionnaire? [5]

**P.T.O.**

**Q4)** Write short notes on **any three** of the following

**[18]**

- a) Objectives of research
- b) Types of ratio scales
- c) Randomised Block Design
- d) Choice of data collection methods
- e) Design of Experiments

**SECTION - II**

**Q5) a)** Explain the meaning and significance of the concept of “Standard Error” in sampling analysis. **[6]**

b) A as a sample of 8 units from normal population gives an unbiased estimate of population variance as 4.4. Find the 95 percent confidence limits for population standard deviation  $\sigma$  (given  $X^2_{df,U} = 16.01$  and  $X^2_{df,L} = 1.69$ ) **[5]**

c) Explain in brief the data processing operations generally used in any research. **[5]**

**Q6) a)** Explain with suitable example, the application of Genetic Algorithm to various research problems. **[6]**

b) What is multiple regression? When is application of this technique appropriate? **[5]**

c) Describe the steps in application of Data Envelop Analysis (DEA) method. **[5]**

**Q7) a)** Describe in brief, layout of a research report covering all relevant points **[6]**

b) What is bibliography and its significance in context of a research report? **[5]**

c) What are the basic ways of presenting statistics in a research report? **[5]**

**Q8)** Write short notes on **any three** of the following:

**[18]**

- a) Measures of ordinal data
- b) ANOVA in Latin Square Design
- c) Discriminant analysis
- d) Simulated Annealing method
- e) Task of interpretation in research





Total No. of Questions : 10]

SEAT No. :

P4110

[Total No. of Pages : 3

[4860]-307

M.E. (Production) (CAD/CAM)

COMPUTERAIDED DESIGN

(2008 Pattern)

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instruction to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** a) Describe briefly the various data exchange systems currently in use. [8]

b) Discuss the stages in product life cycle and the importance of each stage.

Differentiate between Forward Engineering and Reverse Engineering. [8]

**Q2)** a) What is Homogeneous Coordinate System? Explain the necessity of Homogeneous Coordinate System for transformation of geometric entities using suitable examples. [8]

b) Why parametric representation of geometrical entities are preferred in CAD software? Explain your answer with non-parametric and parametric equations of appropriate geometric entity. [8]

**Q3)** a) Find the transformed coordinates when a square (1,1), (1,2), (2,2) and (1,2) is rotated by  $60^\circ$  in clockwise direction about a line passing through one of its vertices (1,1) and another arbitrary point (3,4). [8]

b) What is rendering? What are the different stages of rendering an image? [8]

**P.T.O.**

- Q4) a)** Develop the equation of Bezier curve, find the points on the curve for  $t = 0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}$  and 1, and plot the curve for the following data. The coordinates of four control points are given by [8]

$$V_0 = [2,2,0]$$

$$V_1 = [2,3,0]$$

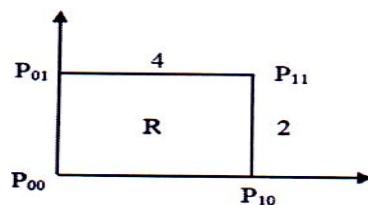
$$V_2 = [3,3,0]$$

$$V_3 = [3,2,0]$$

- b) Define Explicit, Implicit and parametric representation of geometrical entities and their advantages and disadvantages. [8]

- Q5) a)** Explain the procedure of mass property calculations in CAD software. [9]

- b) Find the equation of B-spline surface that covers the region R? Also, find the surface vectors and its mid-point? [9]



## SECTION - II

- Q6) a)** Find the minimum distance between: [8]

- i) A point and a surface
- ii) A curve and a surface
- iii) Two surfaces

- b) Compare IGES and STEP. [8]

- Q7) a)** Why Euler's formula is used in solid modeling? Verify it for tetrahedron and a cube. How can you use a cylinder primitive to generate a sphere? [8]

- b) A plane passes through the three points  $P_0(1,2,3)$ ,  $P_1(2,4,5)$ , and  $P_2(4,2,3)$ . Find the surface area that is bounded by the parametric domain  $u = [0,1]$  and  $v = [0,1]$ . Use three point Gauss quadrature. [8]

**Q8)** a) What are the requirements of Engineering Animation? Explain the Keyframe animation technique. [8]

b) Why do we need NURBS? What are the advantages and problems of NURBS? [8]

**Q9)** a) What are the different techniques used to decide assembling sequence to generate assemblies? [8]

b) Explain various types of surface entities. Derive parametric equation of analytical surface models. [8]

**Q10)** Write short notes on any three [18]

- a) B-Rep scheme
- b) Parametric programming
- c) Hidden surface removal algorithm
- d) Virtual realism



[4860]-308

**M.E. (Production) (CAD/CAM)  
COMPUTERAIDED MANUFACTURING  
(2008 Pattern)**

*Time : 3 Hours]*

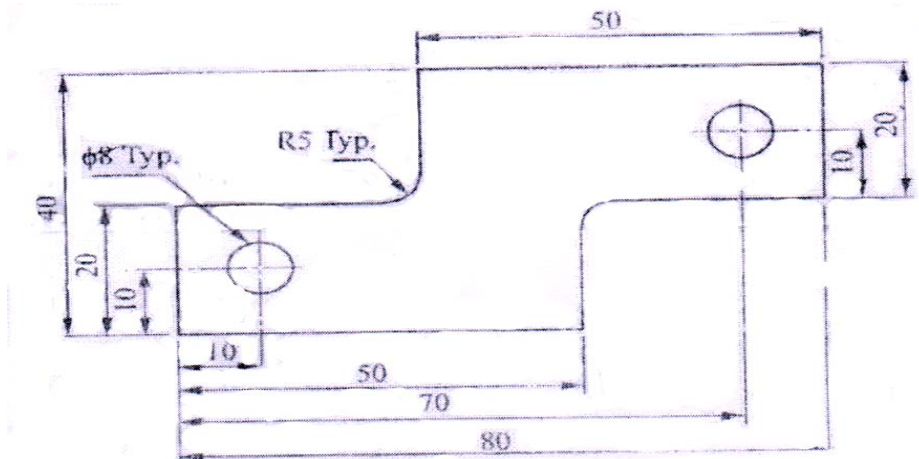
*[Maximum Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of non-programmable electronic calculators is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Describe any three standard controllers used in CNC machines. [6]  
 b) What are the requirements of structure in case of CNC machine tools? [5]  
 c) Describe in brief the types of dimensioning systems used in NC part prints. [5]
- Q2)** a) Write a NC program to drill two holes (8 mm dia. each) at different places for the work piece as shown in Figure 1. The depth of hole is 10 mm. The cutting tool is positioned above the work piece. [10]



Assume suitable data if needed

Figure 1

- b) How is the tool nose radius relevant in CNC turning center programming? Explain with suitable example. [6]

**P.T.O.**

- Q3) a)** Write a complete APT program (Geometric and Motion commands) for the work piece as shown in Figure 2 [10]

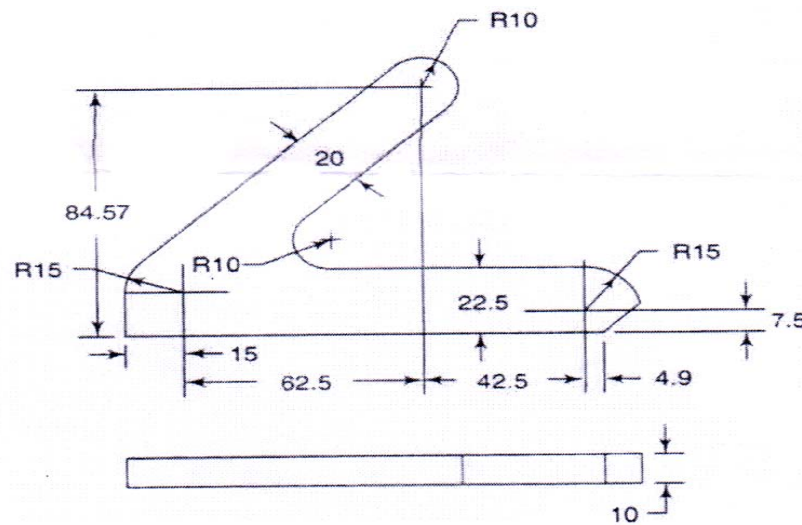


Figure 2

- b) What are the advantages and limitations of combined DNC/CNC systems? [6]

- Q4)** Write short notes on any three of the following. [18]

- Automated welding
- Machining centers
- CNC-CMM
- Configuration of DNC systems
- Rolling guideways in CNC systems

## SECTION-II

- Q5) a)** What are the issues in interfacing handling and storage with manufacturing? [5]
- b) Describe in brief the AGV system applied in FMS. [5]
- c) A recirculating conveyor has a total length of 700 ft. Its speed is 90 ft/min and spacing of parts carriers along its length is 14 ft. Each carrier can hold one part. Automatic machines are used to load and unload the conveyor at its load and unload stations. The time required to load a part is 0.25 min and unload time is same. The required loading and unloading rates are both 2.0 parts/min. [6]

- i) What is maximum possible flow rate of parts on conveyor system?
- ii) How many parts can be contained on the conveyor system if every carrier were filled to capacity?
- iii) How much time is required for the conveyor to make one complete loop?

- Q6)** a) Describe the AS/RS design process for any manufacturing industry. [6]  
b) What are the measurement and inspection capabilities made possible by computer and software in a CMM? [5]  
c) What are the factors considered while designing a stores layout for any factory? [5]

- Q7)** a) What are the three phases in shop-floor control system? [6]  
b) Describe the working of scanning laser technique used for inspection. [5]  
c) What are the applications of barcode techniques in a modern manufacturing unit? [5]

- Q8)** Write short notes on any three of the following: [18]  
a) Distributed inspection and final inspection  
b) Sensors used in automated inspection  
c) Human workers in future automated factory  
d) Local Area Networks in manufacturing  
e) Factory data collection systems



Total No. of Questions : 8]

SEAT No. :

P4112

[Total No. of Pages :2

[4860]-309

**M.E. (Production - CAD/CAM)**  
**OPTIMIZATION TECHNIQUES**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Maximum Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from section I.*
- 2) *Answer any three questions from section II.*
- 3) *Draw suitable flow charts wherever necessary.*
- 4) *State your assumptions clearly.*

**SECTION-I**

**Q1) a)** Explain necessary conditions for single variable optimization. **[8]**

**b)** Find the solution by using the Lagrange Multipliers: **[8]**

$$\text{Minimize } f(x, y) = kx^{-1}y^{-2}$$

$$\text{Subject to: } g(x, y) = x^2 - y^2 - a^2 = 0$$

**Q2) a)** Discuss Secant method. **[8]**

**b)** Find the minimum of  $f = x(x-1.5)$  in the interval (0.0, 1.00) to within 10% of exact value. Use Exhaustive Search method. **[8]**

**Q3) a)** Explain Powell's method. **[8]**

**b)** Minimize  $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$  starting from the point

$$X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}. \text{ Use Powell's method.} \quad \mathbf{[8]}$$

**Q4) Write short notes (Any THREE):** **[18]**

- a) Langrage multipliers
- b) Quasi-Newton method
- c) Conjugate directions
- d) Elimination methods
- e) Saddle point

**P.T.O.**

## SECTION-II

- Q5)** a) Discuss Exterior penalty function method. [8]  
b) Explain Heuristic search methods for nonlinear constrained optimization. [8]
- Q6)** a) Explain Genetic operators in view to Genetic Algorithms. [8]  
b) Discuss Artificial Neural Network. [8]
- Q7)** a) Explain Drum-Buffer-Rope control in Theory of constraints. [8]  
b) “Bottlenecks govern both throughput and inventories” - Discuss. [8]
- Q8)** Write short notes (Any THREE): [18]  
a) Interior penalty function method  
b) Simulated Annealing  
c) Optimized Production Technology  
d) Five step procedure for TOC





Total No. of Questions : 6]

SEAT No. :

P3968

[4860] - 31

[Total No. of Pages : 3

**M.E. (Civil) (Hydraulics)**  
**IRRIGATION & DRAINAGE**  
**(2008 Pattern)**

*Time :3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions carry equal marks.*
- 5) *Use of logarithmic tables, electronic pocket calculator is allowed.*
- 6) *Neat diagrams must be wherever possible.*
- 7) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) The climatic conditions existing in a certain area at latitude 25° N during rabi season are given below. Wheat crop is grown for which crop factor may be taken to be 0.75. Making use of Baney Criddle equation determine : [7]
- i) Consumptive use of crops.
  - ii) Net irrigation requirement (assume leaching requirement to be nil)
  - iii) Field irrigation requirement (assume water application efficiency 80%)

Month	Average month temp. (°C)	Monthly % (P) of day time hours of the year	Effective rainfall (cm)
NOV.	19	7.39	1.5
DEC.	15	7.41	1.2
JAN.	13	7.53	2.0
FEB.	14	7.15	--

- b) Explain the terms : [8]
- i) Forms of soil water
  - ii) Saline and alkali soil
  - iii) Saturation capacity
  - iv) Soil moisture storage

**P.T.O.**

- c) Find the field capacity of the soil for the following data : [10]
- i) Depth of root zone = 1.5 m
  - ii) Existing water content = 6.0 %
  - iii) Water applied to the soil = 500 m<sup>2</sup>
  - iv) Dry Density of soil = 1.5 g/cm<sup>3</sup>
  - v) Area of land irrigated = 1000 m<sup>2</sup>
  - vi) Water lost due to evaporation = 10%
- Q2)** a) Write notes with neat diagrams about : [10]
- i) Terraces
  - ii) Bunds
  - iii) Trenches
  - iv) Gabion structures
- b) What do you understand by consumptive use of water? How it is different from evapo-transpiration? [8]
- c) What are the factors affecting irrigation water requirement of a crop. [7]
- Q3)** a) List out different methods of measuring evaporation. Explain any one in detail. [10]
- b) What are the effects of irrigation soil management on soil salinity and alkalinity? [8]
- c) State the different methods of soil conservation. Explain any one in detail. [7]

## SECTION - II

- Q4)** a) State & Explain the components of Drip irrigation system. Explain the concept of design and installation. [8]
- b) Describe the criteria which governs the layout of the sprinkler system. [10]
- c) What are the advantages & disadvantages of sprinkler irrigation? [7]

- Q5)** a) Explain GCA, CCA, equitable water distribution system. [8]  
b) Explain with neat sketch design concept of jack well distribution system. [10]  
c) Write about the reasons for water logging and the ways for reclamation of water logged lands. [7]
- Q6)** a) In a drainage system closed drains are placed with their centers 12.5m above the impervious stratum and the maximum ht. of the drained water table above the centre of the drains is 0.2m. If the spacing of the drains is 30 m and the drains carry 1% of the average annual rainfall in 24 hrs, find the average annual rainfall. Take  $k = 5 \times 10^{-6}$ m/sec. [10]  
b) What are outlets? Enumerate different types of outlets which are in common use. [7]  
c) What is meant by the following terms when they are used in connection with outlets : [8]  
i) Flexibility  
ii) Setting  
iii) Sensitivity  
iv) Proportionality



[4860]-310

M.E. (Production Engineering) (CAD/CAM)

ADVANCED STRESS ANALYSIS

(2008 Pattern) (Elective-I(a))

Time : 3 Hours]

[Maximum Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate answer books.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Square bracketed figures to the right indicate full marks.
- 4) Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.
- 5) Assume suitable data, if necessary.

**SECTION-I**

- Q1)** a) Explain stress deviator tensor and its invariants. Express von Mises stress in terms of second invariant of stress deviator tensor. [8]
- b) Define an octahedral plane. Write an expression of normal shear component of stress tensor on this plane. [10]

OR

- Q2)** a) Determine the stress fields that arise from the following stress functions:
- i)  $\phi = Cy^2$
  - ii)  $\phi = Ax^2 + Bxy + Cy^2$
  - iii)  $\phi = Ax^3 + Bx^2y + Cxy^2 + Dy^3$
- where A, B, C and D are constants [10]
- b) Using castigliano's theorem, determine the deflection of point A of the step shaft as shown in figure 1. The second -area moment of the beam between points A and B is  $I_1$ , and from B to C the second -area moment is  $I_2 = 2I_1$ , The entire beam is made of a material with modulus of elasticity of E. [8]

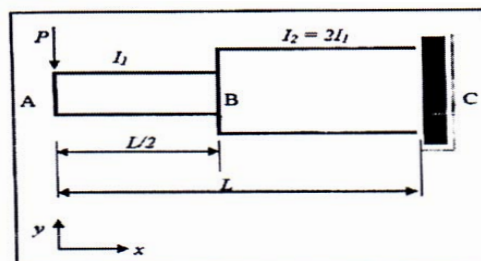


Figure 1 (Shaft fixed at end C)

**Q3)** Consider the complex potentials  $\gamma(z) = Az, \psi(z) = Bz$ . where A and B are complex constants. Derive the explicit expression for the displacements corresponding to a uniform stress field using fundamental stress combination

$$\sigma_x + \sigma_y = 2\left(\gamma'(z) + \overline{\gamma'(z)}\right) = 2(A + \bar{A}) + 4\text{Re}A = 4A_R$$

$$\sigma_y - \sigma_x + 2i\tau_{xy} = 2\left(\bar{z}\psi''(z) + \psi'(z)\right) = 2B = 2(B_R + iB_I)$$

OR

**Q4)** Explain how conformal mapping provides a convenient means to find elasticity solutions to interior and exterior problems of complex shape. [16]

**Q5)** Explain with sketch an experimental stress analysis using [16]  
 a) Brittle coat method and  
 b) X-ray techniques.

### SECTION-II

**Q6) a)** Consider a flat plate of some metal alloy that is to be exposed to repeated tensile-compressive cycling in which the mean stress is 25 MPa. If:  $a_0 = 0.25\text{mm}, a_c = 5.0\text{mm}, m = 4.0, A = 5 * 10^{-15}, Y = 2.0$ , and  $N_f = 3.2 * 10^5$  cycles calculated using relation [10]

$$\frac{1}{A\pi^{m/2}(\Delta\sigma)^m} \int_{a_0}^{a_c} \frac{da}{Y^m a^{m/2}}$$

Estimate the maximum tensile stress to yield the fatigue life prescribed.

**b)** Explain the mechanism of fatigue crack initiation and propagation in ductile metals. [8]

OR

**Q7) a)** Explain experimental procedure to plot S-N curve. [8]  
**b)** Consider an unnotched specimen with an endurance limit of 255 MPa. If the specimen was notched such that  $K_f = 1.6$ , what would be the factor of safety against failure for  $N > 10^6$  cycles at a reversing stress of 115 MPa.  
 i) Solve by reducing  $S'_e$   
 ii) Solve by increasing the applied stress. [10]

**Q8)** A semicircular surface crack in a pressure vessel is 10 mm deep. The crack is on the inner wall of the pressure vessel and is oriented such that the hoop stress is perpendicular to the crack plane. Calculate  $K_I$  if the local hoop stress = 200 MPa and the internal pressure = 20 MPa. Assume that the wall thickness  $\gg 10$ mm. [16]

OR

**Q9)** A structural component made from a high strength steel is subjected to cyclic loading, with  $\sigma_{\max} = 210$  MPa and  $\sigma_{\min} = 70$  MPa. This component experiences 100 stress cycles per day. Prior to going into service, the component was inspected by nondestructive evaluation (NDE), and no flaws were found. The material has the following properties:  $\sigma_{ys} = 1000$  MPa,  $K_{Ic} = 25$  MPa  $\sqrt{m}$ . The fatigue crack growth rate in this material is the same as in problem 9. The NDE technique can find flaws  $> 2$  mm deep. Estimate the maximum safe design life of this component, assuming that subsequent in-service inspections will not be performed. Assume that any flaws that may be present are semicircular surface cracks and that they are small relative to the cross section of the component. [16]

**Q10)** Using the Paris-Erdogan equation for fatigue crack propagation, calculate the number of fatigue cycles corresponding to the combinations of initial and final crack radius for a semicircular surface flaw tabulated below. Assume that the crack radius is small compared to the cross section of the structure.

$$\frac{da}{dN} = 6.87 \times 10^{-12} (\Delta K)^3, \text{ Where } da/dN \text{ is in m/cycles and } \Delta K \text{ is in MPa } \sqrt{m}$$

Also  $\Delta\sigma = 200$  MPa. [16]

Initial crack radius in (mm)	Final crack radius (mm)
1	10
1	20
2	10
2	20

Discuss the relative sensitivity of  $N_{\text{tot}}$  to:

- Initial crack size and
- Final crack size

(Assume  $\Delta K = 0.663\Delta\sigma\sqrt{\pi a}$ )



Total No. of Questions :8]

SEAT No. :

**P4518**

**[4860]-311**

[Total No. of Pages : 2

**M.E.(Production)(CAD/CAM)**

**b - TRIBOLOGY AND SURFACE ENGINEERING**

**(Elective - I) (2008 Course) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain adhesive wear and derive the Archard equation for wear. [12]  
b) How Rowe modified this equation. [4]
- Q2)** a) Differentiate between Hydrostatic and hydrodynamic bearings. State their applications. [8]  
b) Derive petroff's equation. What are its limitations? [8]
- Q3)** a) Derive Reynolds equation with usual notations. [8]  
b) State and explain pressure distribution in short journal bearing under hydrodynamic conditions. [8]
- Q4)** a) Write a short note on stick-slip Phenomenon. [6]  
b) Explain two methods for surface Topography measurement. [6]  
c) State the characteristics of lubrication oil. [6]

**SECTION - II**

- Q5)** a) Discuss the concept and importance of Surface Engineering. [8]  
b) Explain Geometrical parameters of Superficial Layer. [8]

**P.T.O**

- Q6)** a) Give the classification of coatings according to various modes. [8]  
b) Compare the following.  
i) Coated tools with uncoated tools. [4]  
ii) Diamond coating with TiC coating. [4]
- Q7)** a) State and explain potential properties and parameters of Coatings. [8]  
b) Discuss the service properties of coatings with reference to anti-corrosion and decoration. [8]
- Q8)** Describe the principle of working , process parameters and their effects in  
a) Physical Vapor Deposition. [6]  
b) Ion Implantation. [6]  
c) Sputtering. [6]





Total No. of Questions : 8]

SEAT No. :

**P4114**

[Total No. of Pages :2

**[4860]-312**

**M.E. (Production) (CAD/CAM)**  
**INDUSTRIAL ROBOTICS & ARTIFICIAL INTELLIGENCE**  
**(2008 Pattern) (Elective-I)**

*Time : 3 Hours]*

*[Maximum Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Define Robot. Explain six degrees of freedom associated with the robot manipulator. **[10]**
- b) Explain **[8]**
- i) Repeatability
  - ii) Compliance
  - iii) Robot Accuracy
  - iv) Spatial Resolution
- Q2)** a) Differentiate between open-loop and closed-loop servo systems. **[8]**
- b) Explain: **[8]**
- i) PD
  - ii) Feedback controller and
  - iii) PID
- Q3)** a) Why there is a need of Sensor? List the different types of sensors used in robot. Explain any two Sensors in detail. **[8]**
- b) What are the different drives used in Robot? State the advantages and disadvantages of hydraulic drives in robot. **[8]**

***P.T.O.***

- Q4)** a) Explain methods of defining positions in space. [8]  
b) Explain in brief: [8]  
i) Mechanical Grippers  
ii) Vacuum Grippers

## **SECTION-II**

- Q5)** a) Define Artificial Intelligence. Explain the applications of A.I. [10]  
b) What is the Role of agents in artificial intelligence? Briefly discuss properties of agents. [8]
- Q6)** a) Explain any two search strategies used in A.I. [8]  
b) Explain forward and backward reasoning in A.I. [8]
- Q7)** a) Differentiate between Proposition logic and Predicate logic. [8]  
b) Explain the term knowledge, information and intelligence. [8]
- Q8)** a) Explain the knowledge engineering process in brief. [8]  
b) Explain Simple rational knowledge. [8]



Total No. of Questions : 8]

SEAT No. :

P4115

[Total No. of Pages :2

[4860]-313

**M.E. (CAD/CAM) (Semester-I)**  
**CONCURRENT PRODUCT DESIGN**  
**(2008 Pattern) (Elective-I)**

*Time : 3 Hours]*

*[Maximum Marks : 100*

*Instructions to the candidates:*

- 1) Solve any three questions from each section*
- 2) Answer to the two sections should be written in separate books.*
- 3) Figures to the right indicate full marks*
- 4) Neat diagrams must be drawn whenever necessary.*

**SECTION-I**

- Q1)** a) Discuss concurrent team design and its elements. [8]  
b) Discuss different phases in products life cycle. [8]
- Q2)** a) What are the functional requirements for any product design? [8]  
b) What is concurrent design? Explain its importance in current industry. [8]
- Q3)** a) State the factors which influence the selection of Material while designing a product. [8]  
b) What are the guidelines/considerations for Design For Environment? State the objectives of DFE. [8]
- Q4)** Write short notes on any three: [18]  
a) Mass customization.  
b) Taguchi's system of robustness.  
c) Design for serviceability and maintainability.

***P.T.O.***

## SECTION-II

- Q5)** a) Discuss cost-capacity factor. Explain how this factor is used in decision making. [8]  
b) What is the Life Cycle Cost of product? Explain the steps of Life Cycle Costing Process. [8]
- Q6)** a) Discuss internet based design. [8]  
b) What are the benefits of Modularity in product design? Discuss various types of modularity with the help of sketches. [8]
- Q7)** a) What is importance of VRML in concurrent product Design? [8]  
b) How the concurrent engineering is used to enhance the manufactur ability & other attributes of electronic products? [8]
- Q8)** Write short notes on any three: [18]  
a) PDM tools.  
b) Role of supplier in product development.  
c) Importance of project management in product development.



Total No. of Questions : 8]

SEAT No. :

**P4116**

[Total No. of Pages :2

**[4860]-314**

**M.E.(Production) (CAD/CAM)**

**MECHATRONICS**

**(2008 Pattern) (Elective-II(a))**

*Time : 3 Hours]*

*[Maximum Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from Section I and any three questions from Section II.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assumptions made should be clearly stated and justified.*

**SECTION-I**

- Q1)** a) Elaborate mechatronic system with suitable manufacturing example. [9]  
b) What do you mean by system and define elements of measurement system? [9]
- Q2)** a) Explain various types of pressure and flow sensors. [8]  
b) Explain the terms range, span, error, accuracy, sensitivity, hysteresis and non-linearity errors. [8]
- Q3)** a) Explain transducer signal conditioning process with suitable example.[8]  
b) What is the output voltage of a 10 bit DAC with a 20.0 V reference if the input is [8]  
i) 0B5H  
ii) 20 FH, what input is needed to get a 5.5 V output?
- Q4)** Write short notes on the following: [16]  
a) Computer process control system  
b) Karnaugh map minimization  
c) DAC characteristics  
d) Traditional design and mechatronics design

***P.T.O.***

## SECTION-II

- Q5)** a) Describe briefly program scan and memory scan in Programming Logic Controllers. [8]
- b) Device a circuit that can be used with a domestic washing machine to switch on a pump to pump water for 100s into the machine, then switch off and switch on heater for 50 s to heat the water. The heater is then switched off and another pump is to empty the water from machine for 100s. [10]
- Q6)** a) Explain microcontroller and its components. [6]
- b) Explain, for a microprocessor, the roles of [10]
- i) accumulator,
  - ii) flags,
  - iii) memory address,
  - iv) stack pointers.
- Write pseudocode to represent the following:
- i) If A is yes the B, else C
  - ii) While A is yes do B.
- Q7)** a) Discuss the elements of supervisory Control System. [8]
- b) Explain with suitable example mechatronic control in automated manufacturing. [8]
- Q8)** Write short notes on the following: [16]
- a) Signal conditioning
  - b) Instruction sets in microprocessor 8085
  - c) Relay logic
  - d) Artificial Intelligence in mechatronics



Total No. of Questions : 8]

SEAT No. :

P4117

[Total No. of Pages :2

[4860]-315

M.E.(Production - CAD/CAM)

RAPID PROTOTYPING

(2008 Pattern)

*Time : 3 Hours]*

*[Maximum Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Your answers will be valued as a whole.*
- 6) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 7) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Write in brief on overview of RP-Rapid Prototyping, with its application and benefits. [8]  
b) Explain STL file generation, file verification and Repair in RP. [8]
- Q2)** a) Classify the RP systems and explain Fused Deposition Modeling (FDM) system in detail. [8]  
b) Explain Stereo Lithography (SL) with its principle and applications. [8]
- Q3)** a) What is meant by operational properties of prototype? Explain in brief.[8]  
b) What is stability in RP processes? Explain. [8]
- Q4)** Write short notes on (any Three) [18]  
a) Enterprise Prototyping Centers.  
b) Parts cleaning and finishing in RP process.  
c) Environmental Resistance in RP.  
d) Data acquisition in reverse engineering

**P.T.O.**

## SECTION-II

- Q5)** a) Explain "Ergonomics" in brief in context with Rapid Prototyping. [8]  
b) Explain with a suitable example how rapid fooling helps to enhance production. [8]
- Q6)** a) Describe bilateral exposure of thin sample. [8]  
b) With the help of Block diagram explain the design concept of generation of models, form and fit checking and functional testing is done in RP.[8]
- Q7)** a) Explain briefly the line spread function of scanned Gaussian Laser Beam. [8]  
b) What is alternative approach to RP? Explain the concept in brief. [8]
- Q8)** Write short notes on (any three) [18]  
a) Economic Analysis in RPT.  
b) Miniaturization Using RP.  
c) The working curved equation.  
d) Application of RP in Biomedical.





Total No. of Questions : 10]

SEAT No. :

**P4118**

[Total No. of Pages :2

**[4860]-317**

**M.E.(Production Engineering CAD/CAM)  
CAD/CAM/CAE SOFTWARE DEVELOPMENT  
(2008 Pattern) (Elective-II) (Semester-I)**

*Time : 3 Hours]*

*[Maximum Marks : 100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Answer any three questions from each section.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right side indicate full marks.*
- 5) Use of Calculator is allowed.*
- 6) Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) What is customization of CAD software? What is the need for CAD customization? What are benefits of CAD customization? [8]
- b) What is API? How to design good API? What it matters? [8]
- Q2)** a) What are the tools for customization of CAD software? Discuss object oriented programming (OOP) [8]
- b) Discuss the use of general programming interfaces. [8]
- Q3)** a) What are the different phases of the system engineering process? Explain each in brief. [8]
- b) Explain system dependent programming interfaces for pro-programming (Pro-Engineer). [8]
- Q4)** a) Explain software product development life cycle. [8]
- b) Discuss the waterfall software process model. [8]

***P.T.O.***

- Q5)** a) Write short note on Application frameworks. [9]  
b) Discuss the following with reference to software project management:[9]  
i) Project cost  
ii) Project monitoring and review  
iii) Proposal writing  
iv) Project planning and scheduling  
v) Report writing and presentation  
vi) Personnel selection and evaluation

## SECTION-II

- Q6)** a) How software prototyping helps in software development process? [8]  
b) Discuss Euler operation with reference to solid modeling. [8]
- Q7)** a) Discuss Extreme Programming used for rapid software development.[8]  
b) Discuss core issues in rapid software development process. [8]
- Q8)** a) Explain creation of 2D entities in any CAD software using API. [8]  
b) A software is to be developed for drawing and manipulation of line, arc circle and polygon. Design graphical user interface for the same. [8]
- Q9)** a) What is conventional animation? What are the different steps in used in conventional animation in creation of animated film? [8]  
b) Explain the basic fundamentals of solid modeling representation in any CAD software [8]
- Q10)** Write notes on any three of the following. [18]  
a) Automated drafting and dimensioning using customization  
b) Software testing  
c) User interface design  
d) Computer aided software engineering



Total No. of Questions : 10]

SEAT No. :

P4119

[Total No. of Pages :2

[4860]-318

M.E. (Production (CAD/CAM) )

COMPUTER INTEGRATED MANUFACTURING

(2008 Pattern)

Time : 3 Hours]

[Maximum Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from each section.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume suitable data, if necessary.

**SECTION-I**

- Q1)** a) What are the components of PLM software? Explain. [8]  
b) Discuss any two techniques of improving design before launching a new product in the market. [8]
- Q2)** a) Describe the major elements of CIM. [8]  
b) Describe the need for CIM and the issues addressed by CIM. [8]
- Q3)** a) Prepare a chart showing the data required and data generated in the various sections of a manufacturing Industry. [8]  
b) What is database? What are the objectives and disadvantages of database? [8]
- Q4)** a) What are the features of PDM which help speedy product development? [8]  
b) What are the benefits of GT to the manufacturing industry? [8]
- Q5)** Write notes on [18]  
a) Soft and hard prototyping  
b) Manufacturing cell  
c) SQL

**P.T.O.**

## SECTION-II

- Q6)** a) "A graphical simulation system for the validation and specification of the robot program is an integral part of an advanced programming system." Discuss. [8]  
b) What are the different types of drives used in robots? Explain. [8]
- Q7)** a) Describe the principle of an automated storage and retrieval system used in FMS. [8]  
b) What is a FMC? How does FMC ensure flexibility in manufacturing?[8]
- Q8)** a) Explain with neat sketches types of layout in FMS. [8]  
b) "Networks are today integral parts of CIM systems, which have made data sharing easy, peripheral changing or interfacing easy and information sharing possible," Comment. [8]
- Q9)** a) Discuss how internet is an enabling tool for collaborative product development. [8]  
b) Describe the three basic network topologies. [8]
- Q10)** Write notes on . [18]  
a) Robotic inspection  
b) Network operating systems  
c) AGV in CIM



[4860]-319

**M.E. (CAD/CAM) (Production)**  
**FINITE ELEMENT ANALYSIS**  
**(2008 Pattern)**

Time : 3 Hours]

[Maximum Marks : 100

Instructions to the candidates:

- 1) Answer three questions from Section - I and three questions from Section-II.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assumptions made should be clearly stated and justified.

**SECTION-I**

- Q1)** a) Briefly discuss the steps of FEM and peculiarity of FEM in different engineering field. [6]
- b) By using FEM for bar in fig. 1. loaded as shown [10]
- Determine the nodal displacements, elemental stresses and support reaction using minimum number of elements.  $E=200 \times 10^9 \text{N/m}^2$

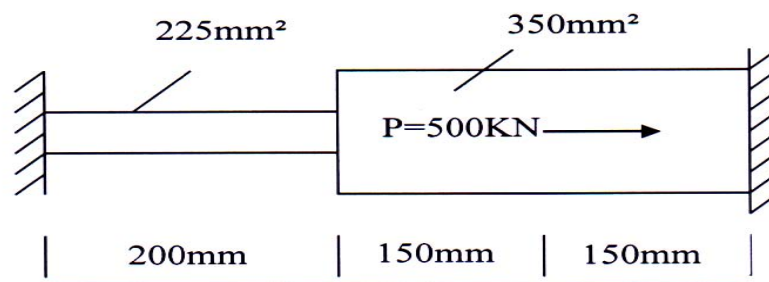


Fig.1

- Q2)** a) Determine an element matrix equation for a general Beam Element. [6]
- b) Determine the temperature distribution in the wall and the heat input at left surface of the wall  $L=0.1\text{m}$ ,  $k=0.01\text{w/m}^\circ\text{C}$ ,  $\beta=25\text{w/m}^2\circ\text{C}$ . Solve for nodal temperatures. [10]

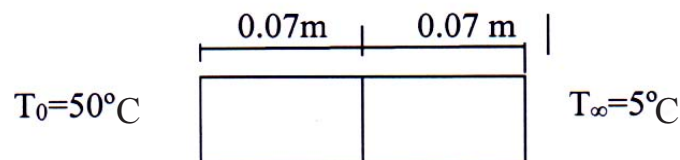
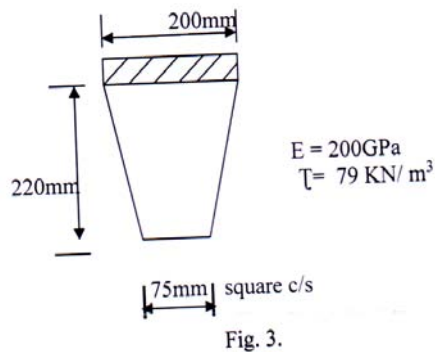


Fig.2.

- Q3) a)** What is the effect of node numbering on Global Stiffness matrix and the final FEM analysis? [4]
- b)** Find the deflection at free end under its own weight using 1, 2, 3 elements for taper Bolt (bar) refer fig.3. [14]



- Q4) a)** Derive an element matrix equation for a general bar element. [8]
- b)** Write short notes on. (Any two) [8]
- i) Shape functions
  - ii) Skyline matrix
  - iii) Sources of error

### SECTION-II

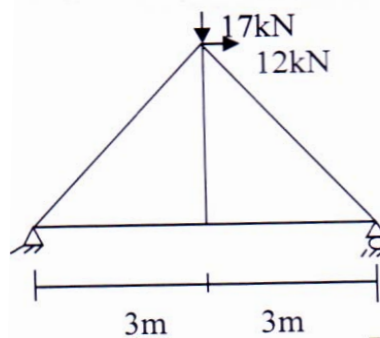
- Q5) a)** Solve the differential equation by using any two methods. [12]

$$\frac{d^2u}{dx^2} - u + 9 = 0 \quad u(0) = u(1) = 0$$

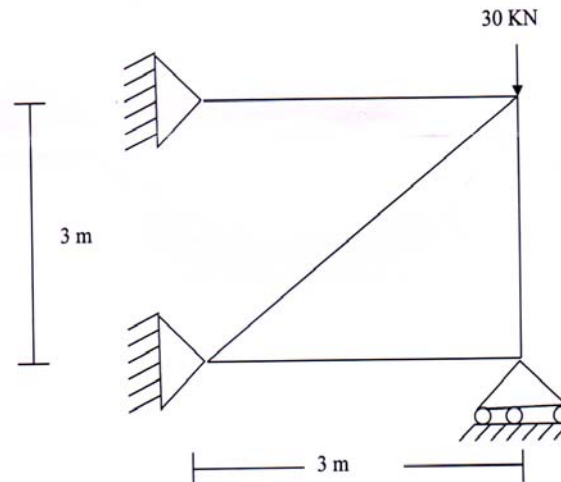
- b)** Derive the expression for 1D element (spar) [6]

- Q6) a)** Explain the concept of Local and Global co-ordinate system with respect to frame Element. [6]

- b)** Analyze the plane truss completely.  $E=400 \text{ GPa}$ ,  $A=30\text{cm}^2$  Refer fig.4 [10]



- Q7)** a) State Hamilton's principle and derive an expression for equilibrium. [8]  
 b) Consider a four bar truss as shown. It is given that  $E=200 \times 10^9 \text{N/m}^2$  and  $A=500 \text{m}^2$  [8]
- Determine the element stiffness matrices for each element.
  - Assemble the structural stiffness matrix 'K' for entire truss.
  - Using the elimination approach, Solve for the nodal displacement.
  - Calculate the reaction forces.



- Q8)** Attempt any two: [16]
- Software packages used for FEA
  - Iso-parametric analysis
  - Consistent and lump mass matrices



Total No. of Questions : 8]

SEAT No. :

**P4458**

**[4860]-32**

[Total No. of Pages : 2

**M.E. (Civil) (Hydraulic Engg.)**

**b-COASTAL ENGINEERING**

**(2008 Course) (Semester-II) (Elective-III) (501311)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithms tables, slide rule, Mollier charts, electronics pocket calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) Derive linear dispersion relationship. **[8]**  
b) Define celerity, group velocity, dynamic free surface boundary condition kinematic free surface boundary condition. **[8]**
- Q2)** a) Discuss types of wave breaking in detail. **[8]**  
b) Derive equation for general refraction by bathymetry. **[10]**
- Q3)** a) Discuss the corrections required to be done in wind velocity measured 10 m above mean sea level ( $U_{10}$ ). **[8]**  
b) Define: Fully developed sea, Swell, Significant wave height, Zero cross wave period. **[8]**
- Q4)** Write short notes on (Any Four): **[16]**  
a) Wave diffraction,  
b) Stokes wave theory,  
c) Construction of wave refraction diagram,  
d) Process of wave generation,  
e) Assumptions made in wave theories.

**P.T.O.**



## SECTION-II

- Q5)** a) List theoretical wave spectra. Write in brief on Pierson - Muskowitz spectrum. [8]
- b) Explain terms in the long term and short term analysis of recorded wave data and significance of the results in the estimation of wave climate. [8]
- Q6)** a) What are the causes of coastal erosion? Differentiate between them. [6]
- b) Discuss cross shore sediment transport. [6]
- c) What are the effects of longshore sediment transport. [6]
- Q7)** a) What are various coastal protection methods? Explain any one of them in detail. [8]
- b) Discuss the environmental parameters which influence the coastal region. [8]
- Q8)** Write short notes on (Any Four): [16]
- a) Sea wall,
- b) Case study related to coastal erosion in India,
- c) Coastal sediment budget,
- d) Mechanism of sediment transport,
- e) Beach profiles.



Total No. of Questions : 8]

SEAT No. :

**P4121**

**[4860] - 320**

[Total No. of Pages : 3

**M.E. (Production) (CAD/CAM) (Semester - II)**

**ADVANCED MATHEMATICS**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer three questions from section - I and three questions from section - II.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** Solve the integral equation

$$\int_0^{\infty} f(x) \cos \lambda x dx = e^{-\lambda} \quad [8]$$

b) If  $A = \begin{bmatrix} 0 & 1+2i \\ -1+2i & 0 \end{bmatrix}$  show that  $(I-A)(I+A)^{-1}$  is a unitary matrix. [8]

**Q2) a)** Show that the transformation

$$y_1 = x_1 - x_2 + x_3$$

$$y_2 = 3x_1 - x_2 + 2x_3$$

$$y_3 = 2x_1 - 2x_2 + 3x_3$$

is regular, write down the inverse transformation. [8]

b) Solve the boundary value problem

$$y'' + y + x = 0 (0 \leq x \leq 1), y(0) = y(1) = 0 \quad [8]$$

by Galerkin's method. Compare your solution with the exact solution.

**P.T.O.**

**Q3) a)** Two masses  $M_1$  and  $M_2$  are connected by an inextensible string which passes over a fixed pulley. Using Lagrange's equations show the acceleration of either mass is

$$\text{numerically} = (m_1 - m_2)g / (m_1 + m_2). \quad [8]$$

b) Solve by the method of Laplace transform the equation

$$y''' + 2y'' - y' - 2y = 0 \text{ with } y(0) = y'(0) = 0 \text{ and } y'(1) = 6. \quad [8]$$

**Q4) a)** Reduce the quadratic form  $2x_1x_2 + 2x_1x_3 - 2x_2x_3$  to the canonical form by an orthogonal reduction and discuss its nature. Also find the modal matrix. [6]

b) Find the curve on which the functional  $\int_0^1 [(y')^2 + 12xy] dx$ , with  $y(0)=0$  and  $y(1)=0$  can be extremised. [6]

c) Find the Fourier transform of  $e^{-x^2}$ . [6]

### SECTION - II

**Q5) a)** For a chi-square distribution with n.d.f. establish the following recurrence relation between the moments.

$$\mu_{r+1} = 2r(\mu_r + n\mu_{r-1}), \quad r \geq 1. \text{ Hence find } \beta_1 \text{ \& } \beta_2. \quad [9]$$

b) The ends A and B of a rod 20 cm long have the temperature at 30°C and 80°C until steady state prevails. The temperature of the ends are changed to 40°C and 60°C respectively. Find the temperature distribution in the rod at time 't'. [9]

**Q6) a)** Solve  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  for,

$0 < x < \pi, 0 < y < \pi$ , given that

$$u(0, y) = u(\pi, y) = u(x, \pi) = 0, \quad u(x, 0) = \sin^2 x. \quad [8]$$

b) Discuss the state variable model and its advantage's over differential equation model. [8]

**Q7) a)** A random variable  $X$  has uniform distribution over  $(-3, 3)$ , find 'k'

for which  $p(x > k) = \frac{1}{3}$ . Also evaluate  $p(x < 2)$  and  $p[|x - 2| < 2]$  [8]

b) The height of six randomly chosen sailors are(in inch) : 63, 65, 68, 69, 71, 72. Those of 10 randomly chosen soldier's are 61, 62, 65, 66, 69, 69, 70, 71, 72, 73. Discuss the light that these data thrown the suggestions that sailors are on the average taller than soldier's. [8]

**Q8) a)** A tightly stretched Flexible string has its ends fixed at  $x = 0$  and  $x = l$ . At a time  $t = 0$ , the string is given a shape defined by  $f(x) = \mu x(l - x)$ , where  $\mu$  is a constant and then released, find the displacement of any point  $x$  of the string at any time  $t > 0$ . [9]

b) Describe in brief types of simulation approaches. [9]



Total No. of Questions : 8]

SEAT No. :

**P4677**

[Total No. of Pages : 2

**[4860]-321**

**M.E. (Production) (CAD/CAM)**  
**PRODUCT LIFE CYCLE MANAGEMENT**  
**(2008 Pattern) (Elective - III (a))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answer to the two sections should be written in separate book.*
- 3) Assume suitable data if necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Neat diagrams must be drawn wherever necessary.*

**SECTION - I**

- Q1)** a) Why customer involvement is important in PLM. Explain it. [5]  
b) Enlist principles for PLM strategies. [5]  
c) Why & How PLM is implemented? And explain its benefits. [6]
- Q2)** a) Explain following in brief: [10]  
i) Bottom-up design  
ii) Top-down design  
b) Explain concept of product reliability and its importance in product development. [6]
- Q3)** a) Define product modeling and explain its fundamental issues. [6]  
b) What are the different types of product models? [5]  
c) Explain role of process chains. [5]

**P.T.O.**

**Q4) Write short notes on:** [18]

- a) Value engineering and product design
- b) Characteristics of PLM
- c) Design for six sigma

**SECTION - II**

**Q5) a) In DFM explain the ‘rule of thumb’ or ‘design rules’ that are used to reduce the cost of component.** [8]

b) What factors are considered to reduce the cost of assembly? [8]

**Q6) a) What are the basic reasons of implementing Product Data Management (PDM) system?** [8]

b) Explain Components of PDM system. [8]

**Q7) Write short notes on:** [16]

- a) Intelligent information system
- b) Use of soft computing facility in product development process.

**Q8) Write short notes on: (any three)** [18]

- a) Taguchi method for design of experiment.
- b) FMEA
- c) Functions of PDM
- d) Advanced database design for integrated manufacturing.



Total No. of Questions : 8]

SEAT No. :

**P4122**

[Total No. of Pages :2

**[4860]-323**

**M.E. (Production) (CAD/CAM)  
MANUFACTURING SYSTEM DESIGN  
(2008 Pattern) (Elective - III)**

*Time : 3 Hours]*

*[Maximum Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right side indicate full marks.*
- 5) Use of electronic pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) What are the enablers required for unattended operation of a single model or batch model automated production cell? [10]
- b) Why do machining operations have an optimum (non- zero, non-infinite) cutting speed? Explain with an example? [6]
- Q2)** a) What is a techno-economical model? Describe the inputs and outputs of any two techno-economical models that you think would be useful in manufacturing? [8]
- b) What characteristics attributable to design and manufacturing contribute to the quality of a manufactured product? Why do machining operations have an optimum (non-zero, non-infinite) cutting speed? [8]
- Q3)** a) What is “concurrent engineering”? From what perspective can CAPP aid concurrent engineering? [5]
- b) How can the ‘Axiomatic Approach” be applied in decision making? [5]
- c) What are the six phases of the general product design process [6]

***P.T.O.***

**Q4)** Discuss the following in brief: **[18]**

- a) Structural and transformational aspects of manufacturing systems
- b) Variant Process Planning
- c) Optimization procedure for single stage manufacturing systems

**SECTION-II**

**Q5)** a) Draw a flowchart and explain the flow of control in a Discrete Event Driven Simulation Program? **[8]**

- b) Distinguish between the following in quality control: **[8]**
  - i) on-line and off-line inspection
  - ii) distributed inspection and final inspection

**Q6)** a) What are the advantages and disadvantages of computer simulation models versus analytical models of manufacturing systems? **[8]**

- b) What makes an automated manufacturing system flexible? Name some of the FMS software and control functions? **[8]**

**Q7)** a) Define 'Group Technology' and 'Part Family'. What is the composite part concept in Group Technology. **[8]**

- b) Distinguish between Lean Manufacturing and Agile Manufacturing (any six features) with examples. **[8]**

**Q8)** Write a short note on the following: **[18]**

- a) On-line and Off-line data collection systems
- b) Principles of agile manufacturing
- c) Hollier method for GT cellular layout





Total No. of Questions : 8]

SEAT No. :

P4123

[Total No. of Pages :2

[4860]-324

**M.E. (Production) (CAD/CAM)**  
**QUALITY & RELIABILITY ENGINEERING**  
**(Elective - III) (2008 Pattern)**

*Time : 3 Hours]*

*[Maximum Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from Section - I and any three questions from Section - II.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assumptions made should be clearly stated and justified.*

**SECTION-I**

- Q1)** a) Give the significance of parameter design strategy? [6]  
b) Explain DOE. [10]
- Q2)** a) Explain AGREE method of reliability allocation. [8]  
b) Explain reliability testing with suitable example. [8]
- Q3)** a) Explain Fault Tree Analysis. [6]  
b) Identify parameters affecting surface finish of work piece turned on CNC machine and carry out parameter design to improve the process parameters. [10]
- Q4)** Write short notes on the following : [18]  
a) Taguchi method  
b) Ishikawa diagram  
c) RPN  
d) HALT & HASS

**P.T.O.**

## SECTION-II

- Q5)** a) What is meant by redundancy in a system? Explain significant difference between active, passive and partial redundancy. [8]  
b) Compare FMECA and why-why analysis. [8]
- Q6)** a) Explain various methods of assessing reliability of a component through accelerated tests Assume that a product has a constant failure rate of  $\lambda = 0.002$  per hour. What is the probability that it will survive or be reliable during the first 1000 hours of operation? [8]  
b) Draw the bath tub curve for industrial product and explain its shape. An element has a probability of successful operation over a given period of 60%. If such elements are connected in parallel estimate the improvement factor. [8]
- Q7)** a) Explain system reliability and its types in detail. [6]  
b) Describe the various approaches available to increase the reliability It is desired to have a reliability of at least 0.990 for a specified service period of 7,000 hours on the assumption of a uniform failure rate, what is the least value of  $\theta$  that will yield this desired reliability? [10]
- Q8)** Write short notes on the following: [18]  
a) Probability distributions  
b) Availability and its types  
c) Life characteristics phases  
d) Markov chain analysis



Total No. of Questions : 10]

SEAT No. :

**P4124**

**[4860] - 325**

[Total No. of Pages : 3

**M.E. (Production - CAD/CAM)**  
**COMPUTERAIDED PRODUCTION PLANNING**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Attempt any three questions from section - I.*
- 2) *Attempt any three questions from section - II.*
- 3) *Answers to the two sections should be written in two different answer books.*
- 4) *Figures on the rights show marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1) a)** Discuss different measures of forecast errors. **[6]**
- b) The demand for the product for last 8 years is given below. Estimate the demand for next two years by regression method. **[10]**

Year	2007	2008	2009	2010	2011	2012	2013	2014
Units	42	50	65	55	60	71	85	68

- Q2) a)** Explain ALDEP use in facility planning. **[8]**
- b) Explain how the GT cell is formed? Discuss with example. **[8]**
- Q3) a)** Discuss GT benefits and limitations. **[8]**
- b) Discuss use of quadratic assignment model adding new machines to existing facility. **[8]**
- Q4) a)** Explain Generative type of Computer Aided Process Planning (CAPP). **[8]**
- b) Discuss the development of CAPP and its limitations. **[8]**

**P.T.O.**

**Q5)** Write short notes (any three) :

[18]

- a) Software for facility planning
- b) Parts classification and coding
- c) Assignment method for adding a new facility planning
- d) Exponential Smoothing
- e) Operations management

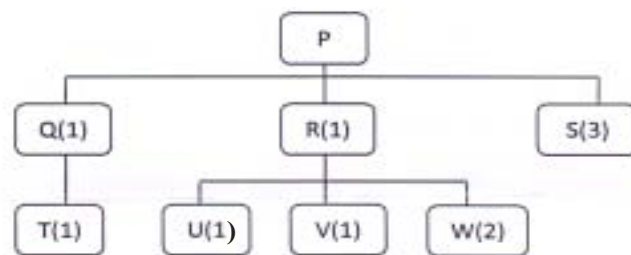
**SECTION - II**

**Q6)** a) How capacity planning is done?

[6]

b) Product structure is as below :

[10]



Inventory status of individual components are as shown

Product	Lead Time	EOQ	Opening stock	On Order
P	2	400	40	0
Q	5	600	100	0
R	4	800	20	0
S	3	2000	1000	0
T	6	1200	0	0
U	2	900	70	0
V	3	1000	0	0
W	2	3000	2300	0

The demand for the product 'P' is 400 on day 16. Prepare MRP for all items.

**Q7)** a) Discuss objectives of the MRP system.

[6]

- b) Four jobs are to be processed using three machines. The time required on machine 'j' for job 'i' is given in the table below : [12]

<b>Job</b>	<b>Time required on</b>		
<b>i</b>	<b>Machine A</b>	<b>Machine B</b>	<b>Machine C</b>
1	5	8	20
2	6	30	6
3	30	4	5
4	2	5	3

How should the jobs be scheduled so as to minimize the total time required to complete all the jobs?

- Q8)** a) Explain ERP implementation issues. [8]  
 b) Find the sequence that will minimize total time required to complete the following tasks : [8]

Task	1	2	3	4	5	6	7	8
Machine I	2	5	4	9	6	8	7	5
Machine II	6	8	7	4	3	9	3	8

- Q9)** a) Discuss evaluation of heuristics in view of Production scheduling. [8]  
 b) The weekly demand for the product has the following distribution : [8]

Demand	1000	1100	1200	1300	1400	1500
Probability	0.03	0.17	0.27	0.28	0.18	0.07

Simulate for 10 weeks and find expected demand. (Use random numbers from calculator).

- Q10)** Write short notes (any three) : [18]

- MRP II
- Software for ERP
- Random number generation
- Gantt chart
- CDS algorithm for sequencing



Total No. of Questions :8]

**P4519**

SEAT No. :

**[4860]-326**

[Total No. of Pages : 2

**M.E.(Production)(CAD/CAM)**  
**b - TECHNOLOGY MANAGEMENT**  
**(2008 Course) (Elective - IV) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Give classification of Technology . Explain in brief holistic model of management of technology. **[8]**
- b) How industry institute partnership can facilitate for targeted basic research? Explain it with suitable example. **[8]**
- Q2)** a) Explain in brief various steps the organizations take for promotion of creativity & innovation. **[8]**
- b) Explain the following. **[8]**
- i) Role of governance in technology management.
  - ii) Business strategy for success in competitive technology.
- Q3)** a) What are the different channels of technology transfer ? Give success factors of it. **[8]**
- b) “Technology contributes to the competitive levels of a country.” Explain in detail. **[8]**
- Q4)** Write SHORT NOTES on any THREE **[18]**
- a) Appropriate technology.
  - b) Concepts in invention & innovation.
  - c) Technology cycle.
  - d) Challenges of commercialization research.

***P.T.O.***

## SECTION - II

- Q5)** a) What are board steps to be followed in procedure for world patenting? [8]  
b) What are the basic norms for persons entitles for applying for patents?[8]
- Q6)** a) What are the objectives of innovation foundation ? What are recent government policies for it ? [8]  
b) Explain your views on central government schemes for science & technology infrastructure. [8]
- Q7)** a) Discuss relation of functional capability and level of innovation in technology assessment. [8]  
b) Explain the procedural steps followed in Analytical Hierarchical process (AHP) with an example. [8]
- Q8)** Write SHORT NOTES on any THREE [18]  
a) Concepts of National Innovation System (NIS)  
b) Role of World Trade Organization.  
c) Technological leadership.  
d) Limitations of AHP.



Total No. of Questions : 8]

SEAT No. :

P4125

[Total No. of Pages :2

[4860]-328

M.E. (Computer Engineering)/(Computer Networks)

APPLIED ALGORITHMS

(2008 Pattern)

Time : 3 Hours]

[Maximum Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from each section.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

**SECTION-I**

**Q1) a)** Prove that **[8]**

$$1^2 + 2^2 + 3^2 + \dots + n^2 = n(n+1)(2n+1)/6$$

For all positive integers n.

b) Explain the Bay's theorem and then use this Bay's theorem for the following example:

In the township there are 525 men and 634 women. 3% of men are color blind and 2% of women are color blind. Find the probability that individual is a woman. **[8]**

**Q2) a)** The Fibonacci sequence 1, 1, 2, 3, 5, 8, 13, 21, 34, ... is defined as

$$F_0 = 0, F_1 = 1, F_i = F_{i-1} + F_{i-2}, i > 1.$$

Represent this in the recursive SPARKS procedure. **[8]**

b) If  $A(n) = a_m n^m + \dots + a_1 n + a_0$  is a polynomial of degree m then Prove  $A(n) = O(n^m)$ . **[8]**

**Q3) a)** Write a procedure which finds the mode and frequency of an unsorted array. Analyze its computing time. Is your method better than sorting? **[8]**

b) Explain Binary search procedure based on Devide and Conquer strategy. **[8]**

**P.T.O.**



- Q4)** a) Explain Greedy method. Explain the knapsack problem with appropriate example. [9]
- b) Show that the computing time of algorithm OBST is  $O(n^2)$ . [9]

### SECTION-II

- Q5)** a) Write a short note on Absolute approximation. [8]
- b) Write a short note on Epsilon approximation. [8]
- Q6)** a) Devise an algorithm which accepts a number in decimal and produces the equivalent number in binary. [8]
- b) Obtain a nondeterministic algorithm of complexity  $O(n)$  to determine whether or not there is a subset of then numbers  $a_i$  where  $1 \leq i \leq n$  that sums to M. [8]
- Q7)** a) Compare CRCW and EREW algorithms. [8]
- b) Write short note on PRAM model. Explain with suitable example. [8]
- Q8)** a) State prefix computation problem. Write parallel algorithm for the same. State time complexity of this algorithm. [9]
- b) Explain with suitable example, pointer doubling problem. [9]



Total No. of Questions : 8]

SEAT No. :

**P4126**

**[4860] - 329**

[Total No. of Pages : 2

**M.E. (Computer Engineering) & (Computer Network) (Semester - I)**  
**EMERGING TRENDS IN COMPUTER ARCHITECTURE**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Solve any three questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) Explain the architecture of Itanium. **[8]**  
b) Differentiate between IA-32 architecture and IA-64 architecture. **[8]**
- Q2)** a) What is multicore architecture? Explain with examples. **[8]**  
b) Explain symmetric and asymmetric multiprocessors with relative advantages and disadvantages. **[8]**
- Q3)** a) Explain PARAM net in detail. **[8]**  
b) Explain Giga Bit Ethernet and Quadernet in brief. **[8]**
- Q4)** Write short notes on any three : **[18]**
- a) Cluster of Workstations (COWs) and Network of Workstations (NOWs)
  - b) Blade servers
  - c) Direct Attached Storage (DAS) and Network Attached Storage (NAS)
  - d) Storage Area Network (SAN)

***P.T.O.***

## SECTION - II

- Q5)** a) Explain the different types of multithreading. [8]  
b) Explain TCP/IP protocol suite. [8]
- Q6)** a) Explain Sneha - Samuham computing model. [8]  
b) Explain log P communication model. [8]
- Q7)** a) Explain shared memory programming and message passing programming. [8]  
b) Explain data parallel programming model. [8]
- Q8)** Write short notes on any three : [18]
- a) ATM switches and networks
  - b) ARC model
  - c) ARCC model
  - d) High performance FORTRAN



Total No. of Questions : 8]

SEAT No. :

**P4459**

**[4860]-33**

[Total No. of Pages : 2

**M.E. (Civil) (Hydraulic Engineering)**

**c-WATER MANAGEMENT AND CONVEYANCE SYSTEMS**

**(2008 Course) (Semester-II) (Elective-III) (501311)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Solve any three questions from each section.*
- 2) Answer to the two sections should be written in separate answer booklet.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data if necessary.*
- 5) Use of electronic pocket calculator is allowed.*

**SECTION-I**

- Q1)** a) Explain the nature of waste inputs to water system. [6]  
b) Write short notes on Any Two: [12]  
i) Dissolved oxygen models.  
ii) Eutrophication reduction method.  
iii) Contaminant decay modeling.
- Q2)** a) A weir is to be constructed on coarse sand to retain water to a depth of 6 m. If the sheet pile at the downstream side of the apron has a depth of 3.0 m, what should be the safe exit gradient becomes 0.166? [8]  
b) Explain in detail diffusion and dispersion regimes. [8]
- Q3)** a) Discuss in detail about reservoir analysis. [8]  
b) What are the various water tariff structures, explain any two in detail? [8]
- Q4)** a) What are the elements of water distribution system, explain it? [8]  
b) Explain the technology and impacts of water conservation practices. [8]

*P.T.O.*

## SECTION-II

- Q5)** a) Discuss in detail about urban drainage and runoff control. What are the difficulties involved with urban drainage system. [8]
- b) Explain deterministic and stochastic model. [8]
- Q6)** a) Discuss in details about the effect of hydraulic structures on river surface profiles. [8]
- b) What are the structural and nonstructural alternatives for flood control. [8]
- Q7)** a) Explain in detail hydro-power system with all its elements. [8]
- b) What do you mean by Diversion Head Works? Draw a sketch of diversion head works and explain it. [8]
- Q8)** a) Draw a neat sketch of a thermal power plant. What are the challenges faced by a thermal power plant in India? Why the maximum energy is achieved by thermal plants in India? [6]
- b) Write short notes on Any Two: [12]
- i) Sediment transport system.
  - ii) Low flow augmentation.
  - iii) Difference between hydro and thermal power station.



Total No. of Questions : 8]

SEAT No. :

**P4127**

**[4860] - 330**

[Total No. of Pages : 3

**M.E. (Computer Engineering & Computer Network) (Semester - I)**  
**PRINCIPLES AND PRACTICES FOR IT MANAGEMENT**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Question No. 04 and 08 are compulsory. Out of the remaining attempt 02 questions from section - I and 02 questions from section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) Explain the steps carried out in managing an IT project. Consider suitable example. **[6]**
- b) What are the similarities and differences in handling of a project with respect to an IT project and any other non - IT project. **[6]**
- c) Explain how can any IT organization perform social responsibilities. Give suitable examples. **[4]**
- Q2)** a) You are the project manager for your organization. Management has asked that you create a detailed cost estimate for a new solution they'd like to implement. What type of project estimating must account for every expense within a project before the work begins **[6]**
- i) Bottom - up estimating
  - ii) Top - down estimating
  - iii) Zero -based budgeting
  - iv) Parametric estimating

***P.T.O.***

- b) “Risk identification is an iterative part of project planning.” Explain how project risks are identified early in planning. [6]
- c) What is the budget at completion (BAC). Explain BAC for estimation of project cost. [4]

- Q3)**
- a) What is PND? Explain its significance in scheduling of IT project. Give suitable example. [6]
  - b) Why is it necessary to review IT projects? How does it help project scheduling and handling of constraints. [6]
  - c) How will you handle changes in the project as a project manager of an IT project? Explain the process with suitable example. [4]

**Q4)** Write short notes on (any three) : [18]

- a) Work breakdown structure
- b) Project network diagram
- c) Project priorities establishment
- d) Business ethics

## **SECTION - II**

- Q5)**
- a) Explain the significance of conflict management with respect to team handling in an IT project using modern view of conflict. [8]
  - b) What are the qualities of a good team leader? [4]
  - c) What is stress management? How will you guide your project members for handling stress. [4]

- Q6)** a) Explain knowledge management with its significance in an IT project. **[4]**  
b) Explain any two project quality standards applicable in case of IT project. **[6]**  
c) With short explanation list out the cyber laws applicable for an IT organization. **[6]**

- Q7)** a) What do you think should be the technological impact for agriculture and agricultural products sector. Explain with suitable examples. **[6]**  
b) Explain the impact of mobile technology on banking and insurance domain. What do you foresee in terms of emerging IT projects in this domain in near future? **[6]**  
c) With respect to healthcare domain, what kind of IT projects should be taken up in India in order to provide medical facilities to the masses in near future. **[4]**

**Q8)** Write short notes on (any three) : **[18]**

- a) Energy audit and management  
b) Intellectual property rights  
c) Customer relationship management  
d) Formal versus Informal groups and their impact on project success.





Total No. of Questions : 8]

SEAT No. :

P4128

[Total No. of Pages :2

[4860]-331

**M.E. (Computer Engineering)**  
**ADVANCED SOFTWARE ENGINEERING**  
**(2008 Pattern) (Semester - I) (Elective - I (a))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain the socio technical systems with system design activities. [8]  
b) Explain the requirements engineering tasks. [8]
- Q2)** a) Explain the object oriented design steps with an example. [8]  
b) Explain the importance of architectural design and its tasks. [8]
- Q3)** a) Explain an evolutionary process model. [8]  
b) Give the critical systems development activities. [8]
- Q4)** Explain the following (Any three) : [18]  
a) Formal method  
b) Object model  
c) Non functional requirements  
d) Application architecture

**P.T.O.**

**SECTION - II**

- Q5)** a) Explain two black box testing methods. [8]  
b) Justify the need of estimation with a technique. [8]
- Q6)** a) Explain Extreme Programming. [8]  
b) Give the algebraic specification method. [8]
- Q7)** a) Explain the product quality factors. [8]  
b) How risk assessment is carried out? [8]
- Q8)** Explain the following (Any three) : [18]  
a) Real time system  
b) Software Metrics  
c) UI design  
d) Managing People



Total No. of Questions : 8]

SEAT No. :

**P4129**

**[4860] - 333**

[Total No. of Pages : 2

**M.E. (Computer Engineering) (Semester - I)**

**INTERNET ROUTING DESIGN**

**(Elective - I (C)) (2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Compare between TCP/IP and OSI model. [8]  
b) Explain IPv6 headers in detail. [8]
- Q2)** a) Write and explain router architecture with respect to functional view in detail. [8]  
b) An IPv4 network with IP address 192.168.4.0 is being subnetted into 4 subnets. Give the netmask, netid for each subnet and IP range for each subnet. [8]
- Q3)** a) Develop a specialized K-shortest path algorithm, given that a path can not consist of more than two links. [8]  
b) Discuss the role of ASes (Autonomous Systems) and BGP in routing. Describe the current architectural view of the Internet. How ASes are related to ISPs? [8]
- Q4)** a) Write and explain the features of IS-IS protocol. Compare it with OSPF. [9]  
b) Explain the PIPv2 Protocol. Explain 3 timers in RIPv1. [9]

***P.T.O.***

## SECTION - II

- Q5)** a) List OSPF packet types. Explain the format of Link state Request and update packets. [8]  
b) Write and explain BGP path attributes. [8]
- Q6)** a) What is IP lookup problem? Explain with example any two algorithms for IP lookup. [8]  
b) Explain in detail classful addressing and CIDR. [8]
- Q7)** a) What is packet classification problem? Explain any two algorithms used in packet classification. [8]  
b) Explain QoS protocol for QoS routing. [8]
- Q8)** Write short notes on any three : [18]  
a) Layer 2 VPN traffic engineering.  
b) Voice over MPLS.  
c) Source based QoS routing.  
d) MPLS and GMPLS.



Total No. of Questions : 8]

SEAT No. :

**P4130**

[4860] - 334

[Total No. of Pages : 2

**M.E. (Computer Engineering)**

**MOBILE COMPUTING**

**(Elective - I) (2008 Pattern) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer any three questions from section - I and any three questions from section - II.*
- 2) *Use separate answer sheets for both sections.*
- 3) *Assume suitable data wherever necessary.*

**SECTION - I**

**Q1)** Explain the data stored on SIM.

**[18]**

- a) Administrative data
- b) Security Related data
- c) Subscriber data
- d) Roaming data,
- e) PLMN data

**Q2)** Explain in brief the Air - Interface of GSM.

**[16]**

**Q3)** Explain in brief SCCP message format with SCCP messages.

**[16]**

**Q4)** Explain in brief:

**[16]**

- a) FDMA
- b) TDMA

***P.T.O.***

## SECTION - II

**Q5)** Explain with schematic of GSM. **[16]**

**Q6)** Explain the Base Station Subsystem with working of BTS, BSC & TRAU. **[18]**

**Q7)** Explain in brief MAP services. **[16]**

**Q8)** Write a short note on any two of the following : **[16]**

- a) TDMA
- b) CDMA
- c) HLR
- d) SIM



Total No. of Questions : 8]

SEAT No. :

**P4520**

**[4860] - 335**

[Total No. of Pages : 2

**M.E. (Computer) (Computer Engineering)  
INFORMATION AND NETWORK SECURITY  
(2008 Course) (510105) (Elective-II) (Semester-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any THREE questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam table is allowed.*
- 6) *Assume Suitable data if necessary.*

**SECTION-I**

- Q1)** a) Enlist and explain steps necessary for creating information security policy. [7]
- b) Explain different threat scenarios with suitable examples. [7]
- c) What is service interruption-based attack? Explain with suitable example. [4]
- Q2)** a) What requirements must a public key cryptosystems fulfil to be a secure algorithm. [8]
- b) Explain Data Encryption Standard (DES) encryption structure, structure of encryption round and DES function. [8]
- Q3)** a) What are the basic protections provided by secure socket layer? How can it found whether the user has entered into a secure site? [8]
- b) What is meant by bastion host? Describe the screened-subnet firewall system with a Demilitarized Zone (DMZ). [8]

**P.T.O.**

**Q4) Write Short Notes on (Any Three). [16]**

- a) ARP hazard.
- b) Issues in multi-level secure systems.
- c) Privacy and data protection.
- d) Physical and logical access control.

**SECTION-II**

**Q5) a) What is discrete logarithm problem? Explain different approaches for solving discrete logarithm problem. [10]**

b) Explain what is Blind-key cryptosystem with suitable example. [8]

**Q6) a) Explain different type of attacks, that are possible on packet-filtering firewalls? [8]**

b) Explain how firewall differs from intrusion detection system? List the issues to be addressed when installing firewall. [8]

**Q7) a) Explain how wireless security is different from wired data security, and how WEP addresses security in wireless LANs. [8]**

b) Explain security of the Diffie-Hellman algorithm. Discuss advantages and limitations of the Diffie-Hellman algorithm. [8]

**Q8) Write Short Notes on (Any Three) [16]**

- a) Source masking and hidden channels.
- b) One time password.
- c) Secure RSVP.
- d) Time stamping and reliable ordering of events.

ζ ζ ζ



Total No. of Questions : 12]

SEAT No. :

**P4131**

**[4860]-337**

[Total No. of Pages : 2

**M.E. (Computer Engineering)  
WEB SERVICES AND SOA  
(2008 Pattern) (Elective - II(c)) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) Write Short Note on Business Process Execution Language for Web Services. [4]  
b) Write Short Notes on SOAP and WSDL [10]  
c) Compare Web services with Distributed Computing. [4]

OR

- Q2)** a) Explain Web Services security and specifications. [8]  
b) Explain Web Services Reliable messaging and WS Policy. [10]

- Q3)** a) Explain Evolution and need of SOA and Business Value of SOA. [8]  
b) Draw components of Service Oriented Architecture and explain SOA. [8]

OR

- Q4)** a) Write Short Notes on : [8]  
i) ESB. ii) SOA Characteristics  
b) Explain IBM on Demand operating environment. [8]

- Q5)** a) Write Short Note on Enterprise solution assets (ESA). [6]  
b) Explain in detail determining nonfunctional requirements. [4]  
c) Explain service models for legacy application integration and enterprise integration. [6]

*P.T.O.*

OR

- Q6)** a) Write Short Note on SOA Delivery Strategies. [8]  
b) Explain SOA Life Cycle with neat diagram. [8]

**SECTION - II**

- Q7)** a) Explain how Quality assurance is achieved SOA. [6]  
b) Explain in detail Service-oriented design process. [6]  
c) Explain ESB architecture in detail. [6]

OR

- Q8)** a) Write a note on 'Tools available for appropriate designing in SOA. [6]  
b) Explain determining services and tasks based on business process model. [6]  
c) How security implementation is done in SOA? Explain. [6]

- Q9)** a) Explain obtaining Quality of Service in SOA governance. [8]  
b) Explain distributing service management and operational management challenges in Web services management. [8]

OR

- Q10)** a) Explain Role of ESB in SOA governance. [4]  
b) Explain SOA governance in detail. [8]  
c) Explain effect of changes to services in the SOA lifecycle. [4]

- Q11)** a) Explain What is Blog with some example and explain different types of blogging. [8]  
b) Explain RSS with suitable example, also explain RSS Feed. [8]

OR

- Q12)** a) Write short note on JavaScript, explain various applications of JavaScript in detail. [8]  
b) Write short note Ajax and the applications. [8]



Total No. of Questions : 8]

SEAT No. :

**P4132**

**[4860]-338**

[Total No. of Pages : 2

**M.E. (Computer Engineering) (Semester - I)**

**EMBEDDED SYSTEM DESIGN**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Ans. any 3 questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Discuss use of signal conditioners and data converters in embedded system. [8]
- b) Compare microprocessors, microcontrollers and DSP Processor architectures. Which architecture are more suitable to develop embedded systems & How? [8]
- Q2)** a) Discuss the functions and Applications of Real time clock and watch dog timer of ARM7. [6]
- b) Discuss the interfacing of ADC/DAC with ARM7 & describe the I/O map. [6]
- c) Illustrate with example the serial and Parallel Communication & interfacing with ARM7. [6]
- Q3)** a) Explain the Architecture & features of MIPS R5000 Processor. [8]
- b) What are the major challenges in the Design of Embedded systems? [8]
- Q4)** a) Explain the interfacing of Timer/counter or stepper motor and applications in Embedded system. [9]
- b) Explain/Discuss the serial communication Protocol architecture of RS485 and CAN. [7]

**P.T.O.**

## SECTION - II

- Q5)** a) Explain how interrupts are handled in RTOS. [8]  
b) Explain the Design and architecture of mobile phone as an embedded system. [8]
- Q6)** a) How the C/C++ program is converted into ROM image? Explain the steps also explain the architecture & features of MIPS R5000 Processor [8]  
b) Explain the use of stacks and queues data structure in Embedded system software. [8]
- Q7)** a) Discuss important features of Vx works in Detail. [6]  
b) State the difference between Compilers and Cross Compilers. [6]  
c) Explain interprocess synchronization and Communication. w.r.t. Embedded O.S. [6]
- Q8)** a) Explain with example the embedded program structure in terms of breaking into Leader files, configuration files, functions & modules. [8]  
b) What is the use of re-entrant functions in embedded system software. [8]



Total No. of Questions : 8]

SEAT No. :

P4133

[Total No. of Pages : 2

[4860]-339

M.E. (Computer Engg.) (Semester - II)

DISTRIBUTED SYSTEM

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate answer books.
- 2) Answer any three questions from each section.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right side indicate full marks.

**SECTION - I**

- Q1)** a) What is a distributed system? Give some examples of distributed systems. Explain the advantages and disadvantages of distributed systems. [8]  
b) Enlist and explain the characteristics and challenges of distributed systems. [8]
- Q2)** a) How do clock synchronization issues differ in centralized and distributed computing systems? [8]  
b) Explain the remote method invocation mechanism for communication in distributed systems. [8]
- Q3)** a) Explain the Bully election algorithm in detail. [8]  
b) What is deadlock in distributed system? Explain the ostrich algorithm to handle the deadlock. [8]
- Q4)** Write notes on (Any three) : [18]  
a) Distributed transactions  
b) Java RMI  
c) Client-Server Model  
d) Mutual Exclusion

P.T.O.

## SECTION - II

- Q5)** a) Explain in brief sequential and release consistency models. Give the relative advantages and disadvantages of these models. [8]  
b) Explain the working of object-based distributed shared memory. [8]
- Q6)** a) Discuss the relative advantages and disadvantages of using full-file caching and block caching models for the data-caching mechanism of a distributed file system. [8]  
b) What are the desirable features of a good naming system? [8]
- Q7)** a) What is a key distribution problem? Explain the centralized approach for key distribution in symmetric cryptosystems. [8]  
b) Explain the User login authentication mechanism in detail to provide security in distributed system. [8]
- Q8)** Write detailed notes on ANY THREE : [18]  
a) Cryptography  
b) XML Security  
c) DCE Security service  
d) Sun NFS



Total No. of Questions : 8]

SEAT No. :

P4460

[4860]-34

[Total No. of Pages : 4

M.E. (Civil/Structures)

STRUCTURAL MATHEMATICS

(2008 Course) (Semester-I) (501401)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt three questions from section-I and three questions from section-II.
- 2) Answers to the two Sections should be written in separate books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of non programmable electronic calculator is allowed.
- 6) Assume suitable data, if necessary.

**SECTION-I**

Q1) a) Using Flexibility method, analyze the beam shown.

[12]

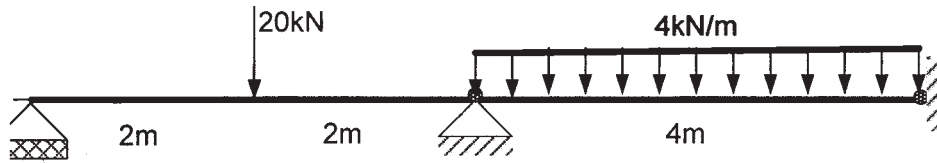


Fig.1.a

b) Discuss the concept of banded matrix. Explain the band width and half band width of stiffness matrix with a suitable example. [5]

Q2) a) A 2.4 m long boom is held by ball and socket joint at A and by two cables BD and CD as shown in the Fig. 2a, find the displacement of joint D if weight of 380 N is attached at D. Use stiffness method. [12]

P.T.O.

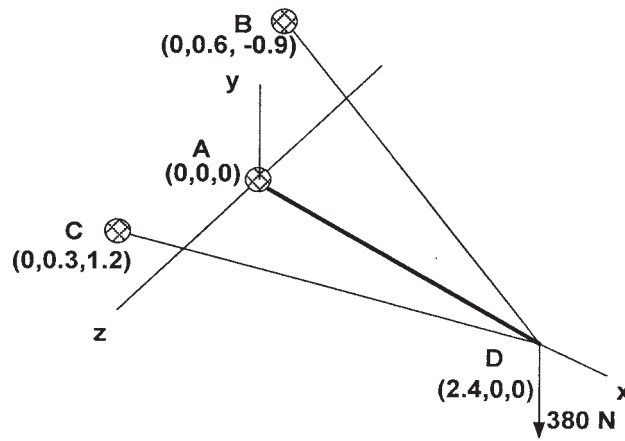


Fig. 2.a

- b) Estimate the lowest buckling load of a uniform pin ended column of length  $L$  and flexural rigidity  $EI$  using Eigen value technique. Divide the column in three equal parts. [5]

**Q3)** a) For a space frame member, develop the member stiffness matrix with proper sketches. [8]

- b) Derive the transformation matrix for the grid member. [8]

**Q4)** a) Using Euler's method, find an approximate value of  $y$  when  $x = 0.3$ , given that  $dy/dx = 2xy$  and  $y = 0.5$  when  $x = 0$ . Take  $h = 0.1$ . [7]

- b) Solve the pair of simultaneous equations [9]

$$dy_1/dx = y_2, y_1(0) = 1$$

$$dy_2/dx = y_1 * y_2 + x^2 + 1, y_2(0) = 0$$

Estimate the values of  $y_1(0.2)$  and  $y_2(0.2)$ .



## SECTION-II

- Q5) a)** A fixed beam of variable flexural rigidity supports a concentrated load  $W$  as shown in Fig. 5a. Estimate the deflection under the load considering three sub intervals of the beam. Use finite difference method. [8]

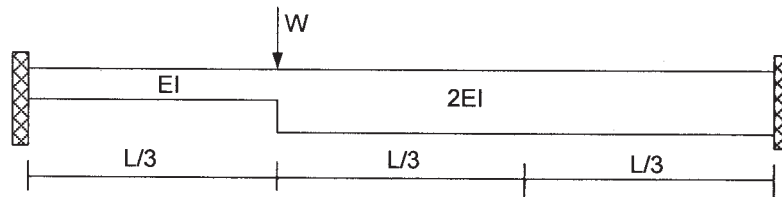


Fig. 5.a

- b)** A simply supported uniform rectangular plate of size 3m by 6m supports a uniformly distributed load of intensity  $500 \text{ kN/m}^2$  over one half of the plate as shown in Fig. 5b. Estimate the deflections at the interior nodes, assuming the thickness of the plate  $t = 50 \text{ mm}$ , Poisson's ratio  $= 0.25$  and Modulus of elasticity  $E = 2 \times 10^5 \text{ N/mm}^2$ . Divide the plate into  $2 \times 4$  mesh. Use finite difference method. [9]

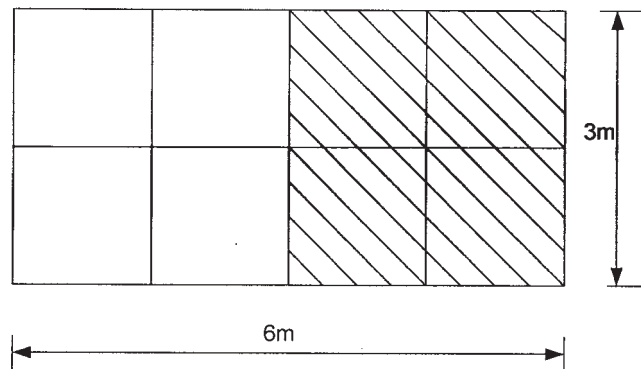


Fig 5.b

- Q6) a)** Values of  $y$  are given at values of  $x$  as shown below. [10]

$x$	1.0	1.5	4.0	6.0
$y$	16.0	22.5	40.0	36.0

Calculate the value of  $y$  at  $x = 4.5$  using Lagrange interpolation Technique.

- b)** What do you understand by Spline interpolation? What are cubic splines? State the conditions for a spline to be cubic. [7]

**Q7) a)** With a schematic diagram show the coefficients of different operators for the second order, third order and fourth order central differences. **[5]**

b) The data given in table, fit a formula of the type  $y = a x^n$ . Find the values of  $a$  and  $n$  and hence the required formula. **[11]**

$x$	10	20	30	40	50	60	70	80
$y$	1.06	1.33	1.52	1.68	1.81	1.91	2.01	2.11

**Q8) a)** Compute the Integral  $\int_2^5 (1+x^4)dx$  using Gaussian three point formula. Compare it with Simpson's 3/8<sup>th</sup> rule by taking  $h = 1$ . **[8]**

b) A beam 9 m long simply supported at its ends supports uniformly distributed load of 4 kN/m over the entire length. Find a Fourier expression for the load. Calculate the deflection and bending moment at its centre. **[8]**



Total No. of Questions : 8]

SEAT No. :

**P4134**

**[4860]-340**

[Total No. of Pages : 2

**M.E. (Computer Engineering / Computer Networking)**

**HIGH PERFORMANCE DATABASE SYSTEMS**

**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any three questions from each section.*
- 2) *Answer to each section should be written on different answer sheets.*
- 3) *Assume suitable data, if necessary.*
- 4) *Draw neat diagram wherever required.*

**SECTION - I**

- Q1)** a) Explain in detail three levels of Database Tuning which can be used by DBA to tune different parameters. [6]  
b) Explain TP-monitor Architecture. [6]  
c) List and explain atleast four features of TPC benchmarks that help make them realistic and dependable measures. [4]
- Q2)** a) Explain hash join algorithm with example. [6]  
b) Discuss heuristics in Optimization. [6]  
c) Explain immediate and deffered view maintenance. [4]
- Q3)** a) Explain 2 phase locking protocol with example. [6]  
b) Explain the difference between hash index and B+ Tree index with example. [6]  
c) Discuss Nested and Compensating transactions. [4]
- Q4)** a) Explain data warehouse Architecture. [6]  
b) Discuss Business Intelligence. [6]  
c) Explain OLAP operation with example. [6]

*P.T.O.*

## SECTION - II

- Q5)** a) Discuss Aggregations in SQL. [6]  
b) How XML integration is achieved with SQL servers. [6]  
c) Discuss about SQL 3 standards, Objected oriented and security features. [4]
- Q6)** a) Discuss how to find candidate and frequent itemsets using APRIORI algorithm with example. [6]  
b) What is supervised and unsupervised learning. [6]  
c) Discuss issues in Data mining. [4]
- Q7)** a) Explain Active and Deductive databases. [6]  
b) Discuss main memory database. Explain relative merits of loading entire database back into main memory before resuming transaction processing. [6]  
c) Brief about Object Relational database. [4]
- Q8)** Write a short note on (any 3) : [18]  
a) LDAP  
b) Webservice  
c) Datawarehouse schema  
d) Dashboards



Total No. of Questions : 8]

SEAT No. :

P4135

[4860]-341

[Total No. of Pages : 3

**M.E. (Computer Engineering)**  
**NETWORK DESIGN ,MODELLING AND ANALYSIS**  
**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Any three questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data,if necessary.*

**SECTION - I**

- Q1)** a) Differentiate poisson and deterministic behaviour with suitable example?[8]  
b) Explain different characteristics considered for building a network topology.[8]

- Q2)** Describe following with respect to network intensive applications(Any Two)[16]  
a) Shared Memory Network Access  
b) Latency Issues  
c) Probability Distribution Function.

- Q3)** Write a short note on : **[18]**  
a) Little's Theorem.  
b) Blocking Probability.  
c) Anaysis of M/G/1 queue on vacation

- Q4)** a) a) Consider an M/M/1 system in which customers arrive according to a Poisson process of rate  $\lambda$ . Service rate is  $\mu = 20$  customers/minute. The average number of customers is  $N=3$ . Calculate  $\lambda$  and  $W$ . **[8]**  
b) We want to draw random samples of two gaskets from a box containing 20 gaskets, three of which are defective. Find the probability function of random variable  $X =$  Number of defectives in the sample. **[8]**

**P.T.O.**

## SECTION - II

- Q5)** a) Analyze performance of PSN network. [6]  
b) Solve Terminal Assignment problem for given data. [10]

Weight of node = 01

Max, capacity of concentrator = 03

	G	H	I	K
a	8	8	2	5
b	9	3	7	2
c	2	11	3	1
d	10	6	7	2
e	4	4	6	0
f	2	3	3	12

- Q6)** a) Describe different tools for BW management and security Management. [8]  
b) Solve Center of Mass Algorithm for the given input. [8]

Node	x	y	wt.
1	32	25	1
2	54	56	1
3	48	49	1
4	75	48	1
5	65	21	1
6	85	26	1

- Q7)** a) Explain different factors to ensure Quality of Service. [8]  
b) Differentiate between Open Queuing and Closed Queuing. [8]

**Q8)** Write a short note on (Any Three)

**[18]**

- a) Network Planning and Implementation.
- b) Performance Analysis of Network Layer.
- c) Multipoint Line Layout Heuristics.
- d) Bin Packing Algorithm.



Total No. of Questions : 8]

SEAT No. :

**P4136**

**[4860]-342**

[Total No. of Pages : 3

**M.E. (Computer)**

**SOFTWARE DESIGN AND ARCHITECTURE**

**(2008 Pattern) (Elective - III (a)) (Theory)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer ANY THREE questions from each section.*
- 2) Answers to the Two Sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary*

**SECTION - I**

**Q1)** Write in brief on ANY SIX of following :

**[18]**

- a) Software development life cycle and place for Software DESIGN in it.
- b) Detailed design
- c) Any one design pattern
- d) Software modules and modularity
- e) Concept of Archetype patterns
- f) Applications of software systems in business
- g) Information hiding, interface
- h) Allocation view

**Q2)** Explain ANY FOUR of the following concepts with examples

**[16]**

- a) User interface design
- b) Major phases of software design process
- c) Data design
- d) Role of design activity
- e) Why and how do we document behavior (Hint state, sequence diagrams)
- f) Component- Connector view

**P.T.O.**



- Q3)** a) Compare and contrast software design and software requirements. [4]  
b) With an example show how client server architectural style is useful for web applications. [4]  
c) Discuss how performance, security are important considerations when designing software systems. [4]  
d) What are the strengths and weaknesses of step-wise refinement strategy.[4]
- Q4)** With a suitable example of your own for any system, draw DIAGRAMS for ANY FOUR of following and also explain concepts involved [16]  
a) Entity structure diagram  
b) ER diagram  
c) ISO 2000  
d) Software design process  
e) Class diagram  
f) Software development life cycle

## **SECTION - II**

- Q5)** In brief state the concept/term; illustrate with good examples the following concepts [16]  
a) Archetype pattern : product or CRM  
b) Design pattern: proxy or iterator  
c) Design attributes: modifiability, portability  
d) Advantages of java technology while designing/implementing software systems
- Q6)** Write short notes on ANY THREE [18]  
a) Software design  
b) How to make web systems user-friendly, usable  
c) Software components, frameworks, programming languages

- d) MVC architecture
- e) UML for documenting design
- f) Advantages of architecture (civil) in building houses and role of an Architect in civil engineering

**Q7)** Write in brief on ANY FOUR of the following : **[16]**

- a) How software design differs from designing other systems like hardware, chair, houses etc
- b) Prototyping of software systems
- c) Object oriented concepts: inheritance, classes
- d) Remote procedure calls and sockets (as connectors)
- e) Interfaces and Documenting software interfaces

**Q8)** State what you understand by following approaches for designing software systems and what are the advantages of the approach. Give example applications of your own to illustrate the following approaches. **[16]**

- a) Jackson structured programming approach
- b) Object oriented approach
- c) Top down approach (Hint: using Modules and subsystems, functional decomposition)
- d) Waterfall model approach to software design and development



Total No. of Questions : 8]

SEAT No. :

P4137

[4860]-343

[Total No. of Pages : 2

M.E. (Computer Engg.)

PATTERN RECOGNITION AND MACHINE VISION

(2008 Pattern) (Semester - II) (Elective - III(b))

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any THREE questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) State and Explain the basic stages involved in the design of a classification system. [8]
- b) Explain classification and regression. Explain different cross validation techniques in brief. [8]
- Q2)** a) Explain Baye's minimum error rate classification in brief. [8]
- b) Explain the Nearest neighbour approach for multi-category classification. Give suitable example. [8]
- Q3)** a) What is Active Shape Model. Explain the role of Active Shape Model in Pattern classification. [8]
- b) What is the role of Dimension reduction in pattern recognition. State and explain different methods in brief. [8]
- Q4)** a) Explain in brief Estimation Theory. [8]

*P.T.O.*

- b) Write a short notes on any two [10]
- i) Principal Component Analysis
  - ii) Discriminant Function
  - iii) Levenberg-Marquardt algorithm

## SECTION - II

- Q5)** a) What is tracking? What are its applications? State & discuss linear 1-D Kalman filter for motion estimation. [10]
- b) Discuss the Optical flow estimation using suitable algorithm. [8]
- Q6)** a) Define & discuss the use of fundamental (F) matrix for locating & motion estimation. [8]
- b) Explain the Projective transformation for Image formation. [8]
- Q7)** a) What is Stereopsis? Discuss correlation method used for stereo matching. [8]
- b) Explain Object recognition using geometrics hashing. [8]
- Q8)** a) State applications of object recognition in different field. [4]
- b) Write a note on any two [12]
- i) Interpretation tree
  - ii) Motion based Segmentation
  - iii) Surface Triangulation



Total No. of Questions : 8]

SEAT No. :

**P4138**

**[4860]-344**

[Total No. of Pages : 2

**M.E. (Computer Engineering)  
NETWORK PROGRAMMING  
(2008 Pattern) (Elective - III (c))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain TCP connection establishment and termination process with neat labeled diagram. [8]  
b) Buffer size limits the size of input datagram. How? Justify. [8]
- Q2)** a) Describe address conversion functions with an example program. [8]  
b) Explain crashing and rebooting of server host. [8]
- Q3)** a) Describe DNS-typical arrangement of clients, resolvers and name servers. [8]  
b) Write a program for UDP echo client-server. [8]
- Q4)** Write short notes on (ANY THREE) : [18]  
a) Routing sockets  
b) Significance of port numbers and allocation  
c) TIME-WAIT state in TCP  
d) Data-link socket address structure

**P.T.O.**

## SECTION - II

- Q5)** a) Explain different types of addressing used in computer network with suitable examples. List the protocols that use these addresses. [8]  
b) Write neat labeled diagram explain IPv4 and IPv6 headers. [8]
- Q6)** a) Explain SNTP protocol in detail. [8]  
b) Write a program for TCP based echo server using threads. [8]
- Q7)** a) Compare and explain TCP iterative and concurrent server in detail. [8]  
b) Explain multicasting on a WAN. [8]
- Q8)** Write short notes on (ANY THREE) : [18]  
a) TCP pre-forked server  
b) IPv6 multicast address  
c) Race conditions and shared data access  
d) IPv6 address testing macros



Total No. of Questions : 8]

SEAT No. :

**P4139**

**[4860]-345**

[Total No. of Pages : 3

**M.E. (Computer Engg.)**  
**ADVANCED INTERNET PROGRAMMING**  
**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer three questions from section - I and three questions from section - II.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

- Q1) a)** Draw a diagram of the Document Object Model (DOM) interface showing the relationship between browser, HTML document, scripts, compiled modules and the DOM. How are the dynamic capabilities of the client enabled? **[10]**
- b)** Explain the following items : **[8]**
- i)** What is the advantage of IPV6 over IPV4?
  - ii)** Describe why an application developer may choose to run an application over UDP rather than TCP?
- Q2) a)** Write shorts on the followings : **[8]**
- i)** Compare 2-tier, 3-tier and N-tier architectures.
  - ii)** Explain how an HTML page differs from a DHTML page.
- b) i)** Suitably explain the architectural pattern called MVC as implemented in the JAVA EE framework?
- ii)** How much data can be send in a Single FTP session? How does Active FTP communication Work?

**[8]**

**P.T.O.**







Total No. of Questions : 8]

SEAT No. :

**P4140**

[Total No. of Pages : 2

**[4860]-346**

**M.E. (Computer Engineering) (Semester - II)**

**SOFTWARE PROJECT MANAGEMENT**

**(2008 Pattern) (Elective -IV(a))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain the best practices of project management. **[8]**  
b) Explain the role of project management in software development with phases of project management. **[8]**
- Q2)** a) Explain the activities of risk management. **[8]**  
b) State and explain the methods for tracking the schedule of a software project. **[8]**
- Q3)** a) Explain the significance of quality factors in project management. **[8]**  
b) Explain the cost benefit analysis. **[8]**
- Q4)** Explain the following.(Any three) **[18]**  
a) Time line chart  
b) Risk mitigation  
c) Project metrics  
d) Critical path

**P.T.O.**

## SECTION - II

- Q5)** a) How estimation helps in project management? Explain with an estimation technique. [10]  
b) Explain the formal technical review process. [6]
- Q6)** a) Explain the purpose of team organization in project management. [8]  
b) Explain the function point analysis for estimation. [8]
- Q7)** a) Explain a process model with its activities. [8]  
b) How to apply count for estimation in object oriented application. [8]
- Q8)** Explain the following. (Any three) [18]  
a) Size oriented metric  
b) COCOMO  
c) Managing Stakeholders  
d) Risk table



Total No. of Questions : 8]

SEAT No. :

**P4141**

**[4860] - 347**

[Total No. of Pages : 2

**M.E. (Computer)**

**b : INFRASTRUCTURE MANAGEMENT  
(2008 Pattern) (Semester - II) (Elective - IV) (510112)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve Any Three Questions from each section.*
- 2) *Answers to each section must be written on separate sheets.*
- 3) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) What do you mean by Infrastructure Management? Explain how growth of internet has affected the infrastructure of an organization. [8]
- b) What is the complexity of today's computing environment? Explain how these complexities are affecting the infrastructure of an organization. [8]
- Q2)** a) What constitutes customer requirements? Explain the effects of identifying customer requirements on the infrastructure of organization. [8]
- b) Explain in brief the factors to be considered in designing IT infrastructure and IT organization. [8]
- Q3)** a) What are the fundamental decisions for Financial Management, as highlighted by ITIL? [8]
- b) What are the activities of Service Level Management? Explain in detail. [8]
- Q4)** Write short Note on Any Three: [18]
- a) ITIL.
  - b) Sub-Processes of Capacity Management.
  - c) Reactive and Proactive activities in Availability Management.
  - d) System Management.

**P.T.O.**

## SECTION - II

- Q5)** a) Explain the Four Layers of Configuration Management System, with the help of a schematic. [8]  
b) Explain the Life cycle of IT Service Continuity Management. [8]
- Q6)** a) With the help of a block diagram, explain the scope of Change Management. [8]  
b) Explain how incident management interfaces with other management processes. [8]
- Q7)** a) Explain following with respect to problem management process: [8]  
i) Objective  
ii) Scope  
iii) Value for business  
iv) Know-error and work around  
b) What is LDAP? Explain LDAP data interchange format. [8]
- Q8)** Write short notes on Any Three: [18]  
a) Data Retention.  
b) Service Desk.  
c) Storage Management.  
d) Firewall.



Total No. of Questions : 10]

SEAT No. :

**P4142**

**[4860] - 348**

[Total No. of Pages : 2

**M.E. (Computer Engineering)**

**c : DATA WAREHOUSING AND DATA MINING**

**(2008 Course) (510112) (Elective - IV) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Q1 and Q6 are compulsory.*
- 2) *Neat Diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*
- 4) *Solve any two questions from Q2, Q3, Q4, Q5.*
- 5) *Solve any two questions from Q7, Q8, Q9, Q10.*
- 6) *Answers to the two sections should be written in separate books.*

**SECTION - I**

- Q1)** a) Compare star schemas, snowflake schemas and star flake schemas of conceptual models in data warehouse. [8]  
b) Explain any two techniques for data reduction in large scale databases. [8]
- Q2)** a) Design semi online computational cube model for retail sales application. [9]  
b) Explain different indexing techniques used in data warehouse. [8]
- Q3)** a) Explain Correlation analysis with suitable example. [9]  
b) Define Association Rule Mining. Explain Apriori Algorithm. [8]
- Q4)** a) Explain constraint-based association Mining with suitable example. [9]  
b) Explain different Data Mining Primitives. [8]
- Q5)** Write a short Note on: [17]  
a) Warehouse Manager.  
b) Materialized View.  
c) Data Compression.

**P.T.O.**

## SECTION - II

- Q6)** a) Explain different parameters used to evaluate classification model. [8]  
b) Explain Spatial data Cube with suitable example. [8]
- Q7)** a) Explain different Measures for selecting the Best split in Decision Tree Classification Model with suitable example. [9]  
b) Explain the Key issues in Hierarchical Clustering with suitable example. [8]
- Q8)** a) Define Regression. Explain Linear regression techniques with suitable example. [9]  
b) Explain Web Usage Mining with suitable example. [8]
- Q9)** a) Explain any data mining clustering technique used for network data analysis. [9]  
b) Explain Rough set data mining approach with suitable example. [8]
- Q10)** Write a short Note on: [17]  
a) Text Mining.  
b) Genetic Algorithms.  
c) Outlier Analysis.



Total No. of Questions : 6]

SEAT No. :

P3969

[Total No. of Pages : 2

[4860] - 35

**M.E. (Civil) (Structures) (Semester - I)**

**ADVANCED SOLID MECHANICS**

**(2008 Pattern)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answer to the two sections must be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** What is compatibility of strains? Obtain strain compatibility equation for 2D problem in elasticity? **[10]**

b) A plane passing through point (x, y, z) in a stressed elastic body has its normal 'n' with direction cosines  $\cos(n, x)$ ,  $\cos(n, y)$ ,  $\cos(n, z)$ . Obtain expressions for the stress resultants ( $T_n$ ) and its direction in terms of six independent components at that point. **[15]**

**Q2) a)** State and explain the Generalized Hook's Law. Hence obtain the Lamé's constants and engineering constants for an elastic isotropic body. **[7]**

b) Define Airy's stress function ' $\Phi$ '. Prove that the stress function satisfies the Biharmonic Governing Equation in absence of body forces. **[8]**

c) If  $\Phi$  is a second degree polynomial function, obtain the stress distribution on the sides of rectangular plate of size  $L \times 2h$ . Neglect body forces. Also check for static equilibrium of the plate under this stress distribution. **[10]**

**P.T.O.**



- Q3)** a) Explain the concept of Stress Invariants. Hence, discuss the state of pure shear and hydrostatic state of stress. [7]
- b) Obtain the solution for stress distribution  $\sigma_r$  and  $\sigma_\theta$  in a hollow cylinder subjected to uniform external pressure 'P<sub>o</sub>' and internal pressure P<sub>i</sub>? [8]
- c) Find stress components of a cantilever beam loaded with point load at the free end by using Airy's stress function polynomial? [10]

### SECTION - II

- Q4)** a) What is axi-symmetric problem? Write the compatibility equation and corresponding stress components by assuming suitable solution? [7]
- b) A thick cylinder of internal radius 120mm and external radius 175 mm is subjected to an internal pressure of 10 N/mm<sup>2</sup>. Determine variation of radial and hoop stresses in the cylinder wall? [8]
- c) Using polar co-ordinates, obtain the solution for stress distribution for radial and transverse stresses if there is a circular hole of radius 'a' inside an infinite elastic medium and subjected to internal pressure 'P<sub>i</sub>'. [10]
- Q5)** a) Derive Poisson's equation for torsion of prismatic bars of non-circular section in terms of stress function  $\Phi$  using St. Venants Theory. Neglect body forces. [15]
- b) A shaft of elliptical c/s having semi major axis 75mm and semi minor axis 25 mm is subjected to a torque of 1 kN-m, determine maximum and minimum shear stress developed in shaft. [10]
- Q6)** a) Derive differential equation for the elastic line of a beam resting on an elastic foundation. [10]
- b) A semi infinite beam is subjected to a force 'P' and a moment 'M<sub>o</sub>' at one end. Starting from the solution for an infinite beam, obtain the solution at a section 'z' from the beam end for [15]
- i) Deflection 'y'.
- ii) Bending moment M<sub>x</sub>.



Total No. of Questions : 8]

SEAT No. :

**P4143**

**[4860] - 353**

[Total No. of Pages : 2

**M.E. (Computer Networks)**

**a : INTERNET ROUTING DESIGN**

**(2008 Pattern) (Elective - I) (Semester - I) (510304A)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What is Internet Routing? Why the routers efficiency in switching a packet to the appropriate outgoing link factor is important. **[8]**
- b) Describes Performance Environment and Measures in network algorithmic with assumptions. **[8]**
- Q2)** a) What are the different OSPF packet types? Explain the format for database distribution packet. Consider a five-router OSPF network. How many entries will be in the routing table at each router? How does route redistribution happen between OSPF and EIGRP. **[8]**
- b) Give the Comparison of the Bellman-Ford Algorithm and Dijkstra's Algorithm with their complexities and example of the same. **[8]**
- Q3)** a) Why do some routing protocols message identification at above the transport layer while some others do so directly over the IP layer. Explain. **[8]**
- b) Explain Distance Vector Protocol Based on Diffusing Computation with Coordinated Update. **[8]**

**P.T.O.**

- Q4)** a) Explain shared forwarding engine router architecture with neat diagram. How is it different than shared nothing architecture? [10]
- b) Identify the functionality in OSPF that allows a static route to be injected into an OSPF domain. [8]

### SECTION - II

- Q5)** a) Explain constrained shortest path routing and its variations when you consider different attributes. [8]
- b) Why would a stub AS use uRPF as its border router? Explain. [8]
- Q6)** a) Describe and compare QOSPF and PNNI routing protocols for QoS routing. [8]
- b) What is the maximum time allowed for a lookup in a router to sustain a data rate of 20 Gbps with an average packet size of 100 bytes? Assume that the router requires 15 ns per packet for other operations in the packet. [8]
- Q7)** a) How is QoS routing different from best-effort routing. [8]
- b) Discuss where and how MPLS. based IP/MPLS traffic engineering is different from “pure” IP traffic engineering. [8]
- Q8)** Write a short note on (Any Three): [18]
- a) PSTN call routing managed IP approach.
  - b) Network management and network topology architecture.
  - c) Routing/Traffic Engineering for Voice Over MPLS.
  - d) Network algorithms and algorithmics.



Total No. of Questions : 8]

SEAT No. :

**P4144**

**[4860] - 354**

[Total No. of Pages : 2

**M.E. (Computer) (Computer Networks)**  
**ADVANCED TCP/IP**  
**(2008 Course) (Elective - I(b)) (Semester - I) (510304)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer 3 questions from Section - I and 3 questions from Section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the procedure to access the domain name system on the local system. [8]
- b) Explain the need of byte order conversation. Explain the library functions (system calls) provided by BSD Unix for byte order conversions. [8]
- Q2)** a) How DHCP exchanges different messages? Explain DHCP options. [8]
- b) Show the contents of all fields for a BOOTP request & reply packet sent from a client with physical address 00:11:22: EF:EA:34? Encapsulate these packets in UDP user & IP datagram. [8]
- Q3)** a) If we extended the domain name syntax to include a dot after the top level domain name and abbreviations would be unambiguous. What are the advantages and disadvantages of the extension? [10]
- b) Explain how to obtain official descriptions of the domain name system of any specific URLs. Write a program to build the client and obtain the official descriptions of DNS. [8]

**P.T.O.**

- Q4)** a) Explain the TELNET standard and find out how the SYNCH operation works. [8]
- b) Explain the mechanism of TELNET, how it forces the remote operating system to respond to control functions quickly. [8]

### SECTION - II

- Q5)** a) What are the differences between FTP & NFS? Compare the rate of transfer issues in FTP & NFS. [8]
- b) Why should file transfer protocol compute a checksum on the file data they receive, even when using a reliable end-to-end stream transfer protocol like TCP? Explain the advantages of using separate TCP connections for control & data transfer. [8]
- Q6)** a) Find out how the UNIX send mail program can be used to implement the main gateway. [6]
- b) Write a program to implement SMTP client. Explain how it delivers the mail message to receivers. [10]
- Q7)** a) Differentiate between HTTP and HTTPS. Explain under what condition proxy cache web pages, when using HTTPS. [8]
- b) Client wants to send data to the server using POST method. Show the HTTP request and response message formats. [8]
- Q8)** a) Explain Real Time Transport Control Protocol (RTCP). Compare RTCP with RTP? [10]
- b) Write notes on: [8]
- i) RSVP and streaming.
  - ii) Multipurpose Internet Mail Extensions.



Total No. of Questions : 8]

SEAT No. :

**P4145**

**[4860] - 355**

[Total No. of Pages : 3

**M.E. (Computer Networks)**

**a : WIRELESS TECHNOLOGY**

**(2008 Course) (Elective - II) (510305) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Neat diagram must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume Suitable, data if necessary.*
- 4) *Attempt any three questions from each section.*

**SECTION - I**

**Q1) a)** Explain the following as related to antenna system:

- i) Directivity
- ii) Effective weight
- iii) Radiation pattern
- iv) Effective area

b) With the help of suitable diagram show various function block and their interconnection in a GSM architecture. What are the major interfaces and protocols used?

**[18]**

**Q2) a)** Discuss different types of communication media being used today. Give comparative analysis of various transmission media.

b) Explain the typical VSAT configuration with figure.

**[16]**

**P.T.O.**

- Q3)** a) State and explain the various network services provided by 802.11 network.
- b) Explain the different techniques of improving coverage and capacity in cellular system.

[16]

**Q4)** Write short note on any two of the following:

[16]

- a) Diversity technique.
- b) Enterprise Authentication Protocol.
- c) GSM signaling protocol architecture.

### **SECTION - II**

- Q5)** a) What are the design flaws of the WEP system? State what is meant by integrity check value? Explain WEP data transmission.
- b) Draw a typical 802.11 MAC frame showing various fields. Expand the frame control field into its subfields. State what is the significance of type, subtype fields and ToDS from DS bits.

[18]

**Q6)** Write short note on any two of the following:

[16]

- a) Frequency translation.
- b) CSMA/CA.
- c) Wi-Max.

- Q7)** a) Explain the errors in wireless network with degrade TCP performance. Briefly explain how TCP snooping can improve the situation?
- b) Name the inefficiencies of Mobile IP regarding data forwarding from a correspondent node to a mobile node. What are the optimization techniques and what additional problems do they cause?

[16]

**Q8)** Explain power management in Bluetooth Network. With reference to Bluetooth protocol explain the following: **[16]**

- a) Characteristics of the piconet channel.
- b) SLO and ACL links.
- c) Packet formation.
- d) Connection establishment.





Total No. of Questions : 8]

SEAT No. :

**P4146**

**[4860] - 356**

[Total No. of Pages : 2

**M.E. (Computer Network)**

**b : INFORMATION SECURITY AND AUDIT MANAGEMENT  
(2008 Course) (Semester - I) (Elective - II) (510305)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Attempt any three questions from section - I and three questions from section - II.*
- 2) *Answer of section - I and section - II should be written on separate answer sheets.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat diagram wherever necessary.*
- 5) *Make suitable assumptions wherever necessary.*

**SECTION - I**

- Q1)** a) What are the different approaches to information security implementation? Discuss in detail. **[8]**
- b) Discuss Software Development Security Problems in detail. **[8]**
- Q2)** a) Who is responsible for risk management in an organization? Which community of interest usually takes the lead in information security risk management? **[8]**
- b) Explain in detail Security Systems Development Life Cycle? **[8]**
- Q3)** a) What is the difference between policy and law? Discuss the five criteria's that policy must meet to become enforceable. **[8]**
- b) What documents are available from the NIST Computer Resource Center, and how can they support the development of a security framework?**[8]**
- Q4)** Write short note on (Any Three): **[18]**
- a) Ethical decision evaluation.
  - b) SETA program.
  - c) Misuse of corporate resources.
  - d) Privacy of customer information.

**P.T.O.**

## SECTION - II

- Q5)** a) What is a content filter? Where is it placed in the network to gain the best result for the organization? [8]
- b) Describe in detail the objective of the planning and risk assessment domain of the maintenance model? Why is this important? [8]
- Q6)** a) What is firewall? What are the three questions that must be addressed when selecting a firewall for a specific organization? [8]
- b) Describe four vulnerability intelligence sources. [8]
- Q7)** a) What are the Physical Security Controls? Explain in detail. [8]
- b) What is Remote Computing Security, and when it is used in a business setting? [8]
- Q8)** Write short note on (Any Three): [18]
- a) Symmetric Encryption System.
- b) Digital Forensics.
- c) Interconnecting Systems.
- d) Risk Management.



Total No. of Questions : 8]

SEAT No. :

**P4147**

**[4860] - 357**

[Total No. of Pages : 2

**M.E. (Computer) (Computer Network)**

**OPERATING SYSTEM DESIGN**

**(2008 Course) (Semester - II) (510308)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat Diagram must be drawn wherever necessary.*
- 4) *Assume Suitable Data if necessary.*

**SECTION - I**

- Q1)** a) What is deadlock? Explain With Example. [8]  
b) What is System Call? Explain system call communication Diagram. [8]
- Q2)** a) What is Group Management? Explain with Example. [8]  
b) What is File Management? Explain functions of File management. [8]
- Q3)** a) What is Real Time Scheduling? Explain different Uniprocessor Scheduling Algorithms? [8]  
b) What is IPC? Explain Different IPC mechanisms and Blocking and Non-Blocking IPC Types. [8]
- Q4)** a) Explain Message Passing Approach with Example. [8]  
b) Explain Classical Problems of Synchronization with the help of Program. [10]

**SECTION - II**

- Q5)** a) What is Thread? Explain Multithreading with Example. [8]  
b) What is Semaphore? Explain Different types of semaphore. [8]

**P.T.O.**

- Q6)** a) Explain Resource Allocation Graph Algorithm. [8]  
b) Explain Bankers Algorithm with the help of Example. [8]
- Q7)** a) Explain Producer Consumer Problem with Solution. [8]  
b) Explain the concept of Cache Memory with Example. [8]
- Q8)** a) Define Operating System and Explain its Task (Minimum Five). [10]  
b) What is Cryptography? Explain types of Cryptography. [8]



Total No. of Questions : 8]

SEAT No. :

**P4148**

**[4860] - 359**

[Total No. of Pages : 2

**M.E. (Computer Network)**  
**ADVANCED SOFTWARE ENGINEERING**  
**(2008 Course) (510310) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the general software process activities. Explain with suitable example. [8]
- b) Explain the significance and importance of generic software product development. [8]
- Q2)** a) Object-oriented approach to software development may not be suitable for real-time systems. Why? Explain with proper justification. [8]
- b) Explain service oriented architecture with suitable example in detail. [8]
- Q3)** a) Why are patterns an effective form of design reuse? Explain with suitable example. [8]
- b) What is essential for forward error recovery to be implemented in a fault tolerant system? [8]
- Q4)** a) Explain the need and significance of formal specification with suitable example. [9]
- b) Explain the layered model of an architecture using suitable example. [9]

***P.T.O.***

## SECTION - II

- Q5)** a) Draw the flow graph for searching a given record in a sorted file using suitable search technique. [8]
- b) Explain why a high-quality software process should lead to high-quality software products. Discuss possible problems with this system of quality management. [8]
- Q6)** a) Why the productivity rate of programmers working as a pair is roughly the same as two programmers working individually? [8]
- b) What is throw-away prototyping? How it is different from clean room software engineering approach? [8]
- Q7)** a) Explain the terms corrective maintenance and adaptive maintenance. Are corrective maintenance and debugging the same? Justify your answer. [8]
- b) What is software, quality? Explain with suitable example measure, Measurement, Metrics and indicator. [8]
- Q8)** Write short notes on: [18]
- a) The people capability Maturity Model.
- b) Soft systems.
- c) Risk Management.



Total No. of Questions : 6]

SEAT No. :

P3970

[Total No. of Pages : 3

**[4860] - 36**  
**M.E. (Civil) (Structures)**  
**STRUCTURAL DYNAMICS**  
**(2008 Pattern)**

*Time : 4 Hours]*

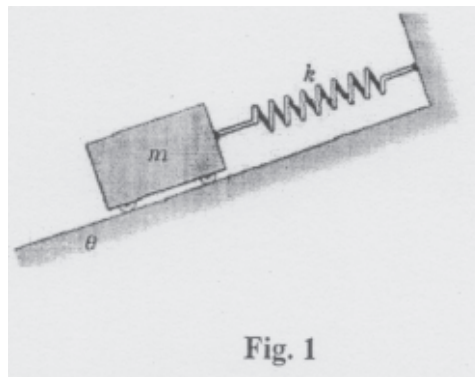
*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any two questions from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Figures in bold to the right, indicate full marks.*
- 4) If necessary, assume suitable data and indicate clearly.*
- 5) Use of electronic pocket calculator is allowed.*

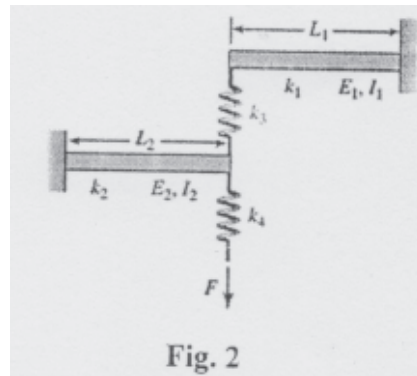
**SECTION - I**

- Q1)** a) What is damping? Explain the various types of damping with suitable examples. **[5]**
- b) Derive the expression for logarithmic decrement. **[10]**
- c) Prove that the natural frequency of oscillation for the mass  $m$  shown in Fig. 1 is independent of  $\theta$ . **[10]**



**P.T.O.**

- Q2) a)** For the two cantilever beams whose free ends are connected to springs as shown in Fig. 2, determine the equivalent spring constant  $k_e$  for the system. [10]



- b) A wide-base truck tire is characterized with a stiffness of  $1.23 \times 10^6$  N/m, an undamped natural frequency of 30Hz, and a damping coefficient of 4400 Ns/m. In the absence of forcing, determine the response of the system assuming non-zero initial conditions, evaluate the damped natural frequency of the system and discuss the nature of the response. [10]
- c) Explain equivalent spring constant with suitable example. [5]
- Q3) a)** Use the Duhamel integral to determine the response of an undamped SDOF system to a loading specified by the triangular pulse as shown in Fig. 3. Obtain the expressions that are valid for  $t < t_d$  and for  $t > t_d$ . The system is initially at rest. [15]

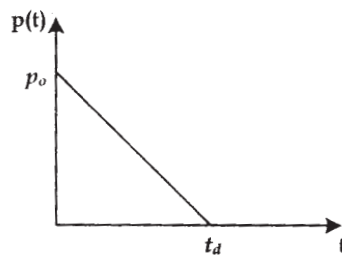


Fig. 3

- b) Find the total response of a single degree of freedom system with  $m = 10$  kg,  $c = 20$  Ns/m,  $k = 4,000$  N/m. The initial conditions are  $x_0 = 0.01$  m,  $\dot{x} = 0$ ,  $F_0 = 100$  N and  $\omega = 10$  rad/s. [10]



## SECTION - II

- Q4)** a) Explain orthogonality of modes. [10]  
b) Find the natural frequencies and mode shapes of a spring-mass shown in Fig. 4. [15]

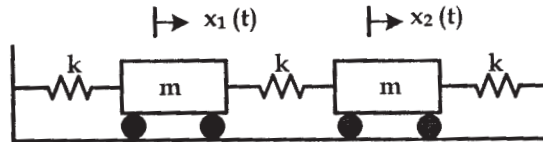


Fig. 4

- Q5)** a) Write a note on constant acceleration method. [15]  
b) What are shear buildings? Explain the governing equation of motion for a three storey shear building. [10]
- Q6)** a) Derive Rayleigh's quotient for a continuous system. [10]  
b) Find the natural frequency and the free vibration solution of a bar fixed at one end and free at the other. [15]



Total No. of Questions : 8]

SEAT No. :

**P4149**

**[4860] - 360**

[Total No. of Pages : 2

**M.E. (Computer) (Computer Networking)**  
**a - NETWORK PROGRAMMING**  
**(2008 Course) (510311) (Elective - III) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) With neat labeled diagram explain TCP connection establishment and termination process. [8]  
b) How port number allocation is done? How does a concurrent server handle simultaneous multiple clients requests? [8]
- Q2)** a) Explain TCP echo client/server. How crashing and rebooting of server host is handled? Explain with example program. [8]  
b) Compare and explain with neat diagram IPv4 and IPv6 socket address structure. [8]
- Q3)** a) Explain operations supported by routing sockets and messages exchanged across routing sockets. [8]  
b) Explain in detail byte ordering and address conversion functions. [8]
- Q4)** Write short notes on (ANY THREE): [18]  
a) TIME-WAIT state in TCP.  
b) DNS.  
c) Socket functions in UDP.  
d) Data-link socket address structure.

**P.T.O.**

## SECTION - II

- Q5)** a) With neat labeled diagram explain IPv4 and IPv6 headers. [8]  
b) What do you mean by dual stack host? Explain with respect to IPv4 client and IPv6 server. [8]
- Q6)** a) Explain with example the TCP pre-threaded server. [8]  
b) Compare and explain multicasting and broadcasting. Explain multicast and broadcast addresses with example. [8]
- Q7)** a) Explain race conditions and shared data access. [8]  
b) Explain how threads handle simultaneous connections for web client. [8]
- Q8)** Write short notes on (ANY THREE): [18]  
a) TCP concurrent server.  
b) SNTP.  
c) Multicast on a WAN.  
d) IPv6 address testing macros.



Total No. of Questions : 8]

SEAT No. :

**P4150**

**[4860] - 361**

[Total No. of Pages : 2

**M.E. (Computer) (Computer Networking)**

**b : NETWORK DESIGN, MODELLING AND ANALYSIS**

**(2008 Course) (Semester - II) (Elective - III)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain in brief Gaussian Probability Density Function. [8]  
b) Discuss in detail Failure probability in establishing network connection. [8]
- Q2)** a) Analyse M/M/1 queueing system using state transition diagram. [8]  
b) Describe following with respect to network applications (Any One): [8]  
i) Delay in Communication Subnet.  
ii) Network Simulation.
- Q3)** Write a short note on: [18]  
a) Jackson's Theorem.  
b) Non-Preemptive Service.  
c) Reservation and polling.
- Q4)** a) Discuss a General Heuristic Algorithm for a multipoint system connectivity between a concentrator and neighbouring terminals. [8]  
b) We want to draw random samples of two gaskets from a box containing 10 gaskets, three of which are defective. Find the probability function of random variable  $X = \text{Number of defectives in the sample}$ . [8]

**P.T.O.**

**SECTION - II**

**Q5) a)** Describe in detail network analysis. Explain the importance of network analysis process. [6]

b) Solve Terminal Assignment problem for given data: [10]

Weight of node = 01, Max. capacity of concentrator = 03.

	G	H	I	K
a	6	8	2	5
b	9	3	5	2
c	2	1	3	1
d	1	6	7	2
e	2	4	4	0
f	2	3	3	1

**Q6) a)** Describe different network security tools. Explain importance of it. [8]

b) Explain Sharma's algorithm with example. [8]

**Q7) a)** Explain with neat diagram architecture of network node. [8]

b) Explain different factors to ensure Quality of Service. [8]

**Q8) Write a short note on (Any Three):** [18]

- a) Security Audit.
- b) Network virtualization.
- c) Subnetting.
- d) Open Queues and Closed Queue.



Total No. of Questions :8]

SEAT No. :

**P4151**

**[4860]-362**

[Total No. of Pages :2

**M.E. Computer(Computer Networks)**

**INFRASTRUCTURE MANAGMENT**

**(2008 Pattern) (Semester - II) (Elective -IV) (510312A)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Solve any three questions form each section.*
- 2) *Answers to each section should be written on separate answer sheet.*
- 3) *Figures to the right indicate full marks.*

**SECTION-I**

- Q1) a)** Explain in detail how the growth of internet has affected the business and the infrastructure of organization. **[8]**
- b) Explain the complexity of today's computing environment. How these complexities are affecting the management of an organization? **[8]**
- Q2) a)** Explain in detail following components of ITIL core library. **[8]**
- i) Service strategy
  - ii) Service Design
- b) Enlist and explain the factors to consider in designing IT infrastructure. **[8]**
- Q3) a)** Explain activities, methdos and techniques in financial management. **[8]**
- b) What is change management? Explain following basic concepts about change **[10]**
- i) Request for change
  - ii) Standard change & emergency change
  - iii) Change advisory board.
  - iv) Change management process.

**P.T.O.**

**Q4)** Write short notes on (Any Two): **[16]**

- a) Availability management.
- b) Configuration management.
- c) Determining customer requirements.

**SECTION-II**

**Q5)** a) Explain the purpose, objectives, scope and business value of problem management. **[8]**

b) What is a service desk? What are the services provided by service desk. **[8]**

**Q6)** a) With the help of a schematic workflow diagram, explain the interface of change management process with configuration management. **[8]**

b) In the context of capacity management, explain

i) Purpose

ii) Objectives

iii) Scope

iv) Business value **[8]**

**Q7)** a) Explain disaster recovery process. What are the advantages of disaster recovery process? **[8]**

b) What are the threats for the infrastructure of an organization? Which access control mechanisms will help to counter these threats. **[8]**

**Q8)** Write short notes on (Any Three): **[18]**

- a) Service level management.
- b) Space management.
- c) Storage management.
- d) Incident management.

*EEE*

Total No. of Questions :8]

SEAT No. :

**P4152**

**[4860]-363**

[Total No. of Pages :2

**M.E. Computer(Computer Networks)**

**b - CONVERGENCE TECHNOLOGIES**

**(2008 Course) (Semester - II) (Elective -IV) (510312)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Explain NT1, NT2, TE1 & TE2 ISDN functional groupings with their functions. Also give one example of each. [8]
- b) What are the benefits of Convergence Technology? Explain what convergence technologies are used in Mobile Communication? [8]
- Q2)** a) Compare X.25, TCP/IP reference model, and ISDN at Network layer.[8]
- b) Explain SS7 protocol Architecture. [8]
- Q3)** a) Explain the role of FECN and BECN bits in Frame Relay Congestion control Mechanism. [8]
- b) Explain BRI and PRI related to ISDN. [8]
- Q4)** Write short notes on any Three of the following: [18]
- a) Functions of the B-ISDN Layers.
  - b) GFC algorithm in ATM.
  - c) ATM Cell Header.
  - d) Call establishment process using VC's & VP's in ATM.

***P.T.O.***



## SECTION-II

- Q5)** a) Explain the various roles played by Information Elements (IE's) used in ATM signalling. [8]
- b) Explain HEC Operation at Receiver in ATM networks, what is the effect of error in cell header. [8]
- Q6)** a) Explain the features and benefits of VIOP. [8]
- b) Explain a call setup based on SIP signalling. [8]
- Q7)** a) Explain various types of media gateways that are controlled by MGCP. [8]
- b) Explain IP Tel Gateways with essential functions. [8]
- Q8)** Write short notes on any Two of the following: [18]
- a) ATM Signaling Protocol Stack.
- b) Q.2931 message header.
- c) H.323 protocol.
- d) Comparison H.323 vs SIP.

*EEE*

Total No. of Questions :8]

SEAT No. :

**P4153**

**[4860]-366**

[Total No. of Pages :2

**M.E. (Chemical)**

**MANAGEMENT OF RESEARCH AND DEVELOPMENT IN  
CHEMICAL INDUSTRIES**

**(2008 Course) (Semester - I) (509102)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from each section.*
- 2) Figures to the right indicate full marks.*

**SECTION-I**

- Q1)** Define Vision and Creativity? How a planned research be strengthened by visionary technocrats? Discuss the qualities to be a visionary? Explain with one example in Indian Context? **[17]**
- Q2)** Explain in detail how financial management plays crucial role in managing research. Why management of research is needed? **[17]**
- Q3)** Correlate growth in research in field of chemical industry which had impact on GDP improvement of mankind? Establish relation of R & D growth to G.D.P growth of a country. **[17]**
- Q4)** What is Inter-disciplinary research? Explain in detail the nature of difficulties involved in managing inter-disciplinary research with atleast one example?**[16]**

**SECTION-II**

- Q5)** What is PERT & CPM? Discuss with example application of these techniques in managing research? **[17]**

**P.T.O.**

**Q6)** What are the developments in research to save the earth from Green House effect and discuss in detail the various pollution free technologies? [17]

**Q7)** Write Short notes on the following: [17]

- a) Factors on which diversification of funds for research & development.
- b) Industrial research vs Academic research.

**Q8)** Explain the role and responsibility of R & D Manager. Discuss the status of R & D in Indian chemical industry? [16]

*EEE*

Total No. of Questions :6]

SEAT No. :

**P4154**

**[4860]-367**

[Total No. of Pages :1

**M.E. (Chemical)**

**ADVANCED SEPARATION PROCESSES**

**(2008 Course) (Semester - I) (509103)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate books.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*
- 5) All questions are compulsory.*

**SECTION-I**

- Q1) a)** What is reverse osmosis? Explain the process & derive the equation of flux for once through continuous operation mode.
- b) What is the process of surface based solid liquid separations involving a second liquid.

[16]

- Q2)** Discuss the classification of membrane processes along with its applications compared to conventional separation processes.

[16]

- Q3)** What is membrane fouling? Discuss it's effects. Give the reasons for fouling with diagram.

[18]

**SECTION-II**

- Q4)** Discuss principle, working & application of reactive separation.

[16]

- Q5)** Explain chromatography along with its application & neat figure.

[16]

- Q6)** Explain electrophoresis & dielectrophoresis and discuss advantages of it.[18]

*EEE*

Total No. of Questions :8]

SEAT No. :

**P4155**

**[4860]-368**

[Total No. of Pages :2

**M.E. (Chemical)**

***a* -COMPUTATIONAL FLUID DYNAMICS**

**(2008 Course) (Semester - I) (Elective -I) (509104)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions form each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, and electronic pocket calculator and steam tables in allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION-I**

**Q1)** Derive 3- Dimensional equation of energy for the moving fluid using differential analysis. Make use of usual notations. **[16]**

**Q2)** Using integral analysis, derive 3- Dimensional equation of motion for horizontal fluid flow. **[16]**

**Q3) a)** Give characteristics features of second order parabolic, hyperbolic and elliptic PDEs. **[6]**

b) Using Implicit Euler's method discretize following PDE **[10]**

$$\partial u / \partial t = \partial^2 u / \partial x^2$$

$$\text{IC: } u(x, 0) = u_0$$

$$\text{BCs: } u(0, t) = u_1 \text{ and } u(4,t) = u_2$$

***P.T.O.***

**Q4)** Write short notes on (any three): **[18]**

- a) Finite Element Methods.
- b) ADI method.
- c) CFD Simulation stages.
- d) Crank Nicholson's method.
- e) Matrix form of governing equations.

### SECTION-II

**Q5)** a) What are Reynold's stresses? Derive equation for the Reynold's stresses for Turbulence flow. **[10]**

b) Describe k- $\omega$  model for turbulence flow. **[6]**

**Q6)** Two-dimensional steady state diffusion of flux,  $\phi$  equation given by 
$$\frac{\partial}{\partial x} \left( \Gamma \frac{\partial \phi}{\partial x} \right) + \frac{\partial}{\partial y} \left( \Gamma \frac{\partial \phi}{\partial y} \right) + S = 0$$
. Where,  $\Gamma$  is the diffusivity; x and y are spatial coordinates and S is the source term. Discretize the given equation using Finite Volume Method. **[16]**

**Q7)** a) Explain with neat sketch, the regimes of multiphase flows. **[8]**

b) Give classification of multiphase flow models. Explain VOF model in detail. **[8]**

**Q8)** Write short notes on (any three): **[18]**

- a) Averaging rules for turbulence flow.
- b) Conservativeness and transportiveness in FVM analysis.
- c) Turbulence Modeling.
- d) Choice of multiphase model.

*EEE*

Total No. of Questions :8]

SEAT No. :

**P4156**

**[4860]-369**

[Total No. of Pages :2

**M.E. (Chemical)**

**b - PROCESS DESIGN AND SYNTHESIS**

**(2008 Course) (Semester - I) (Elective -I) (509104)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic tables slide rule, Mollier charts, and electronic pocket calculator and steam tables in allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Write note on concept and principles in process synthesis. [6]
- b) What are flow simulators? What is its significance in designing of process design? [6]
- c) Write note on the process flow sheet models. [6]
- Q2)** a) What are the stages involved in design of process, discuss in brief. [8]
- b) Discuss important parameters in design of reactor. [8]
- Q3)** a) Write note on optimization techniques used in design of flowsheeting. [8]
- b) What are environment concerns need to be considered for life cycle assessment? Discuss in brief. [8]

**P.T.O.**

- Q4)** a) Write note on green engineering and ethics engineering. [8]  
b) What is significance difference in process simulators. [8]

**SECTION-II**

- Q5)** a) Write note on HENS basics and graphics. [6]  
b) What are performance targets, trade off & utilities for design of heat exchanger network? [6]  
c) What is heat and power integration. [6]
- Q6)** a) Write note on sharp split distillation column. [8]  
b) Write note on feasibility and vapor flow rate for single distillation column. [8]
- Q7)** a) What are the techniques used for detection of binary azeotropes? Discuss in detail. [8]  
b) Write note on binary VLLE. [8]
- Q8)** a) What do mean by the attainment region approach in designing of reactor? Discuss in details. [8]  
b) What is the effect of geometry of mixing on designing of reactors network? Discuss in brief. [8]

*EEE*



Total No. of Questions : 6]

SEAT No. :

**P4669**

[Total No. of Pages : 2

**[4860] - 37**

**M.E. (Civil) (Structures)**

**ADVANCED DESIGN OF CONCRETE STRUCTURES**

**(2008 Pattern) (Semester - I) (Elective - I)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator and relevant IS codes is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1) a)** Draw yield lines for the following : **[10]**
- i) Triangular slab with fixed supports on two adjacent side with one side unsupported.
  - ii) Rectangular slab fixed at two adjacent sides, other two sides free and column at the corner at the junction of free sides.
  - iii) Circular slab with fixed support.
- b) Design a RCC slab for a circular hall of diameter 6m using Yield Line Theory. Assume the peripheral support thickness 300mm. The slab is simply supported. Use M20 Fe500 take Live load = 4 kN/m<sup>2</sup> & floor finish load = 1.2 kN/m<sup>2</sup>. Draw reinforcement details. **[15]**
- Q2) a)** Design a grid slab for a floor of hall 15 × 18m c/c having square grid of 1.5m. Use M25 Fe415 take Live load = 5kN/m<sup>2</sup> and floor finish load = 1.5kN/m<sup>2</sup>. Apply the required check & draw reinforcement details. **[15]**
- b) Design a flat slab for a hall with column spacing 6m × 6m c/c. The size of the column is 500 mm × 500 mm each. Use M20 Fe415 take Live load = 4kN/m<sup>2</sup> & floor finish load = 1.5kN/m<sup>2</sup>. Draw reinforcement details. **[10]**

**P.T.O.**

**Q3)** Design a staging for circular type ESR for 2.5 lakh liters with staging height 10m using M25, Fe500 in earthquake zone III. Safe bearing capacity is 180 kN/m<sup>2</sup>. Design of container is not required. Assume approximate dimension of container, wall, top, bottom slab thickness, beams sizes & number of columns. Design must include calculations of vertical loads and horizontal force calculations. Design the bracings, columns and foundations. Draw the reinforcement details. [25]

### **SECTION - II**

**Q4)** Design deep beam of a hall for flexure and shear for the following : [25]

Clear span = 5m, width of support = 450mm, working UDL on the beam 1500kN/m. Take the total depth of beam = 3.5m. Use M40 & Fe500. Show all Analysis and Design calculations & draw the reinforcement details.

**Q5)** A two span prestressed concrete continuous beam ABC having cross section 300 × 750mm simply supported at A & C and continuous over B with M45 and multistrand cables 2 Nos 12T13 with  $f_y = 1900 \text{ N/mm}^2$  stressed to 75% of  $f_y$ , each span is of 15m, superimposed load on both the spans 12kN/m, Assume 15% loss of prestress. [25]

- i) Determine primary secondary moment at support at prestress and dead load.
- ii) Calculate shift and stress in extreme fibers at working load.
- iii) Draw the resultant line of thrust at working load.

**Q6)** Design post tensioned prestressed concrete slab for a floor for the following Flat interior panel of 8m × 8m, live load on slab 4.5 kN/m<sup>2</sup>, floor finish load on slab = 1kN/m<sup>2</sup>, concrete grade M50HT steel is S3 cables of cross sectional area of each strand 150mm<sup>2</sup> with  $f_y = 1900\text{N/mm}^2$ . Design cables to serve as beams. Assume 3 panels in each direction (floor size 24m × 24m) width of the beam on periphery of floor 600mm and column size 600mm × 600mm. Design must include check fiber stresses in concrete and deflection. Draw sketches showing cable profiles. [25]



Total No. of Questions :8]

SEAT No. :

**P4157**

**[4860]-370**

[Total No. of Pages :2

**M.E. (Chemical)**

**c - ADVANCED THERMODYNAMICS**

**(2008 Course) (Semester - I) (Elective -I) (509104)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Answer any three questions from section I and any three questions from section II.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right side indicate full marks.*
- 5) Use of calculator is allowed.*
- 5) Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Differentiate between macrostates and microstates. Give examples. [8]  
b) Explain phase space in detail. [8]
- Q2)** a) Give the statistical analog of entropy. [10]  
b) Explain with example the use of Stirling's approximation in thermodynamics. [8]
- Q3)** a) Explain the principles of Bose- Einstein statistics. [8]  
b) Explain what are physical models. [8]
- Q4)** a) Explain the Maxwell - Boltzmann statistics. [8]  
b) What is partition function? Give the relation between partition function and the thermodynamic functions of ideal gases. [8]

***P.T.O.***

## SECTION-II

- Q5)** a) Explain what is an ideal monoatomic gas. [8]  
b) What is the Sakur Tetrode equation? [8]
- Q6)** a) Give the Onsager Reciprocal Relation and explain it. [8]  
b) Explain the phenomena of concept of entropy generation in open and closed systems. [8]
- Q7)** a) What is rotational partition function for ideal polyatomic gases? Derive the necessary equation. [9]  
b) Describe the Peltier effect. [9]
- Q8)** a) Explain the rigid rotor concept and how it is used. [10]  
b) Describe the statistical Thermodynamic terms like partition function, canonical ensemble, statistical weight factor micro-canonical ensemble with their significance. [6]

*EEE*

Total No. of Questions :6]

SEAT No. :

**P4158**

**[4860]-371**

[Total No. of Pages :1

**M.E. (Chemical)**

**d: COMPUTERAIDED DESIGN**

**(2008 Course) (Semester - I) (Elective- I) (509104)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts and electronic pocket calculator and steam table is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Explain the elements of computer system. [8]  
b) Explain fixed point iteration method in detail along with its graphical interpretation. [8]
- Q2)** What is vapor pressure equations used in thermodynamic calculations? Mention their names. [16]
- Q3)** a) Enlist the components of CAD packages. [9]  
b) Enlist the physical properties useful in the CAD calculations. [9]

**SECTION-II**

- Q4)** a) Explain Spread sheets and its role in process calculation. [8]  
b) Write short note on conversion reactor. [8]
- Q5)** a) Define degree of freedom. [8]  
b) Draw a flow chart for design of CSTR. [8]
- Q6)** Explain any special software for steady and dynamic simulation of chemical engineering systems. [18]

*EEE*

Total No. of Questions : 8]

SEAT No. :

P4678

[Total No. of Pages : 3

**[4860]-372**  
**M.E. (Chemical)**  
**INDUSTRIAL POLLUTION CONTROL**  
**(2008 Pattern) (Elective - II(a)) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer sheets.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1) a)** Write a note on Ozone depletion. **[8]**
- b) Stack gas flows through an electrostatic precipitator at a rate of 12 m<sup>3</sup>/s. The plate area is 250 m<sup>2</sup> and the drift velocity for the system has been found to be **[10]**

$$W = 2.8 \times 10^5 \text{ dp.}$$

Draw a size-efficiency curve for particles ranging in size from 0.1 to 10µm.

- Q2) a)** It has been estimated that the emission of SO<sub>2</sub> from coal fired power plant is 1656.2 gm/s. At 3 km downwind on an overcast summer afternoon, what is the centerline concentration of SO<sub>2</sub> if the wind speed is 4.50 m/s. **[8]**

Data - Stack parameters -

Height = 120 m, diameter = 1.2m, Exit velocity = 10 m/s, Temperature = 315°C,

Atmospheric conditions - Pressure = 95 KPa, Temperature = 25°C.

A = 0.13, B = 0.392, P = 0.636

- b) Explain various types of plume behaviour with neat sketches. **[8]**

**P.T.O.**

- Q3)** a) What are the limitations of Gaussian plume model? [6]  
 b) Explain selection of waste water treatment process flow diagram. [8]  
 c) Explain the mechanism of inertial impaction. [2]

**Q4)** Explain in brief the pollution caused due to pulp and paper industry and discuss the various methods and equipments which can be used for controlling the same. [16]

**SECTION - II**

**Q5)** a) An activated sludge system is to be designed for secondary treatment of 10,000 m<sup>3</sup>/d of municipal waste water. After primary clarification the BOD is 150 mg/L and it is desired to have not more than 5 mg/L of soluble BOD in the effluent. A completely mixed reactor is to be used and pilot plant analysis has established the following kinetic values  $Y = 0.50 \text{ kg/kg}$ ,  $K_d = 0.05 \text{ d}^{-1}$ ,  $\theta_c = 10 \text{ days}$ . Assuming an MLSS concentration of 3,000 mg/L and an underflow concentration of 10,000 mg/L from the secondary clarifier, determine [12]

- i) The volume of the reactor.  
 ii) The mass and volume of solids that must be washed each day.  
 iii) The recycle ratio.
- b) With neat sketch explain the relationship between cell growth and food utilization. [6]

**Q6)** a) Explain various configurations of activated sludge process and write all the chemical reactions involved during the activated sludge process. [8]  
 b) A secondary clarifier is to be designed to produce an under flow concentration of 35000 mg/L from influent with mixed liquor solids content of 5000 mg/L. The waste water flow rate is 0.08 m<sup>3</sup>/s. Calculate the required clarifier area. The following data are obtained from a settling test in a 100 cm cylinder. [8]

Time, min	0	2	4	6	8	10	14
Interface height, cm	100	88	76	64	54	47	37
Time, min	18	22	26	30			
Interface height cm	30	26	24	20			

- Q7)** a) Discuss the factors affecting storage and collection of solid waste. [8]  
b) Describe physical, chemical and biological properties of solid waste. [8]
- Q8)** a) What are the means and methods for transportation of solid waste? [8]  
b) Explain the procedure for leachate management. [5]  
c) Discuss the properties of compost. [3]





Total No. of Questions :8]

SEAT No. :

**P4159**

**[4860]-375**

[Total No. of Pages :2

**M.E. (Chemical)**

**d-FLUIDIZATION ENGINEERING**

**(2008 Course) (Semester - I) (Elective -II)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*
- 5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.*

**SECTION-I**

**Q1)** a) Define fluidized state and regimization of fluidized state. Discuss the same. [8]

b) What are the applications of fluidization system? [8]

**Q2)** a) Discuss hydrodynamics of fluidization systems. [10]

b) Discuss the operating model for fluidization system. [8]

**Q3)** Explain the following in details;

a) Incipient fluidization. [8]

b) Pressure fluidization. [8]

**Q4)** What are the different flow models? Discuss the generalized wake model and Davidson model. [16]

**P.T.O.**

## SECTION-II

**Q5)** Discuss the following in details and write all necessary equations:

- a) 2 phase & 3 phase inverse fluidized bed. [9]
- b) Immersed horizontal cylinder-to-bed heat transfer. [9]

**Q6)** Derive the kinetic model for conversion of shrinking and growing particles in fluidization. [16]

**Q7)** Write short notes on:

- a) Modeling by bed collapsing. [8]
- b) Geldart's classification for power assessment. [8]

**Q8)** Discuss the following in details and write all necessary equations;

- a) Liquid-solid mass transfer in fluidization. [8]
- b) Immersed vertical cylinder-to-bed heat transfer. [8]

*EEE*

Total No. of Questions :8]

SEAT No. :

**P4160**

**[4860]-376**

[Total No. of Pages :2

**M.E. (Chemical)**

**PROCESS MODELING & SIMULATION**

**(2008 Course) (Semester - II) (509108)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION-I**

**Q1)** Define the equations & notations for Dalton's law, Raoult's law and relative volatility of an ideal vapour - liquid equilibrium system. **[16]**

**Q2)** Develop the equations for liquid & vapour dynamics model of single component vaporizer. **[16]**

**Q3)** Derive a model for continuous distillation column. **[16]**

**Q4)** Write notes on: **[18]**

- a) Modeling of batch reactor.
- b) False position method.

**P.T.O.**

## SECTION-II

- Q5)** Write notes on: **[16]**
- a) Taguchi method
  - b) Full factorial design
- Q6)** Develop three isothermal C&TR model. **[18]**
- Q7)** What is process simulation? Explain the scheme of simulation for distillation column. **[16]**
- Q8)** Discuss the application of optimization in distillation process with suitable example. **[16]**

*EEE*

Total No. of Questions : 8]

SEAT No. :

**P4161**

**[4860]-377**

[Total No. of Pages : 3

**M.E. (Chemical Engineering)**  
**ADVANCED TRANSPORT PHENOMENA**  
**(2008 Course) (Semester-II) (509109) (Theory)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from Section-I and three questions from Section-II.*
- 2) *Answers to the two Sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1) a)** A solid sphere of radius R is rotating slowly at a constant angular velocity  $\Omega$  in a large body of quiescent fluid. Develop expressions for the pressure and velocity distributions in the fluid and for the torque  $T_2$  required to maintain the motion. It is assumed that the sphere rotates sufficiently slowly that it is appropriate to use creeping flow version of equation of motion, use spherical coordinates. **[10]**
- b) Derive the equation for velocity for flow through the annulus using starting following equations: **[8]**

$$v_z = -\frac{(P_0 - P_L)R^2}{4\mu L} \left[ \left( \frac{r}{R} \right)^2 - 2\lambda^2 \ln \left( \frac{r}{R} \right) + C_2 \right]$$

$$\text{BC 1: } \quad r = kR, \quad v_z = 0$$

$$\text{BC 2: } \quad r = R, \quad v_z = 0$$

- Q2) a)** Determine the temperature distribution in an incompressible liquid confined between two coaxial cylinders, the outer one of which is rotating at steady angular velocity  $\Omega_0$  and radius ratio K to be fairly small so that the curvature of the fluid streamlines must be taken into account. The

**P.T.O.**

temperatures of the inner and outer surfaces of the annular region are maintained at  $T_k$  and  $T_l$  respectively, with  $T_k \neq T_l$ . Assume steady laminar flow and neglect the temperature dependence of the physical properties.

[10]

- b) Summarize all the steps required in obtaining the equation of change for the temperature. [6]

**Q3)** a) Heat conduction is flowing through an annular wall of inside radius  $r_0$  and outside radius  $r_1$ . The thermal conductivity varies linearly with temperature from  $k_0$  at  $T_0$  to  $k_1$  to  $T_1$ . Develop an expression for the heat flow through the wall. [12]

- b) Summarize all the steps required in obtaining the equation of change for the temperature. [4]

**Q4)** a) Obtain the equation of continuity for a multi-component mixture. Assume binary system with constant  $\rho^{DAB}$ , with constant  $C^{DAB}$  or with zero velocity. [8]

- b) Explain boundary layer separation and formation of wakes. [4]

- c) Explain effective thermal conductivity of composite solids. [4]

## SECTION-II

**Q5)** a) What are semi-empirical expressions for turbulent energy flux and what are their applications? [8]

- b) What is Reynolds analogy and describe its significance along with neat sketches? [8]

**Q6)** a) Compare Fick's law of diffusion with Newton's law of viscosity and Fourier's law of thermal conductivity, state the analogous relation and explain Chilton-Colburn J-factor Analogy? [8]

b) Obtain the time smoothed equations for velocity and temperature along with neat sketches? [8]

**Q7)** Derive an expression for temperature distribution with more than one independent variables and discuss how these equations are different for velocity and concentration distribution with more than one independent variables. [16]

**Q8)** Write a note on: [3 × 6 = 18]

- a) Time smoothing of equation of change.
- b) Momentum, heat and mass transfer analogies.
- c) Boundary layer theory.



Total No. of Questions : 8]

SEAT No. :

**P4521**

**[4860] - 378**

[Total No. of Pages : 3

**M.E. (Chemical)**

**ADVANCED PROCESS CONTROL**

**(2008 Course) (Semester-II) (509110)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any THREE questions from each section.*
- 2) *Answer to the two sections should be written in separate answer sheets.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data if necessary.*

**SECTION-I**

- Q1)** a) In process identification what is involved in the model formulation stage? [5]
- b) What is the procedure for process identification using impulse response approach? [5]
- c) Why the choice of input functions used in process identification is important? [6]
- Q2)** a) Differentiate between SISO and MIMO system. [5]
- b) Define and explain Observability and controllability in multivariable control systems. [6]
- c) How is RGA used for loop pairing? [5]
- Q3)** Write short note on [18]
- a) Feedforward control.
- b) Ratio control.

**P.T.O.**



- c) Adaptive control.
- d) Antireset wind up.

- Q4)** a) What are the important properties of RGA? [5]
- b) In using multiple single loop feedback controllers to control multivariable systems, what are the two issues to be resolved? [5]
- c) What is decoupling? What is its main objective? How is decoupling achieved? [6]

### SECTION-II

- Q5)** a) In what sense is the control of complete chemical plant different from the control of single processing unit? [5]
- b) How does the design of chemical plant affect its control system? Explain with suitable examples. [6]
- c) When would you introduce intermediate storage tanks in a chemical plant? What is their effect in designing a control system for a plant? [5]
- Q6)** a) What is model based control and what differentiates it from conventional feedback control. [6]
- b) What are the two approaches to model based control system design? [5]
- c) Write short note on IMC. [5]

- Q7)** Write short note on [18]
- a) ANN based control system.
  - b) Fuzzy logic based control system.
  - c) Fuzzy logic based control of bioreactors.
  - d) Fuzzy logic control of semibatch reactors.

- Q8)** a) What do mean by APC based softwares? Enlist and explain its use for Plant wide control system. [6]
- b) What is product quality control? In what sense it is different from material balance control. [5]
- c) What is IMC based PIC? Write short note on it. [5]

ζ ζ ζ

Total No. of Questions : 8]

SEAT No. :

**P4162**

**[4860]-379**

[Total No. of Pages : 2

**M.E. (Chemical Engineering)**  
**CATALYSIS AND SURFACE PHENOMENA**  
**(2008 Course) (Elective-II) (509111)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each Section.*
- 2) Answers to the two Sections should be written in separate answer sheets.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right side indicate full marks.*
- 5) Use of calculator is allowed.*
- 6) Assume suitable data if necessary.*

**SECTION-I**

**Q1)** a) Give the stepwise procedure for determination of pore size distribution in process catalyst. **[10]**

b) Explain the role of adsorption in catalysis. **[6]**

**Q2)** Describe the following methods of catalyst characterization. State the principles involved. **[18]**

a) XPS

b) XRD

c) ESR

**Q3)** a) Compute the rate of homogeneous reactions and heterogeneous reactions on the basis of transition state theory. **[8]**

b) Write a note on dual functional catalysts. **[8]**

**P.T.O.**

- Q4)** a) What is the significance of an adsorption isotherm? What are the different types of isotherms? [10]
- b) Explain volcano plots. [6]

## SECTION-II

- Q5)** a) Distinguish between intraphase and interphase transport processes in solid porous catalyst and derive expression for generalized external nonisothermal interphase effectiveness in terms of Lewis number. [12]
- b) Give the characteristic features of different catalyst deactivation modes. [6]

- Q6)** a) Explain heat transfer and mass transfer in fluidized bed reactors. [9]
- b) State briefly the chemistry and mechanism of fouling. [7]

- Q7)** Derive the equation to calculate surface area of catalyst using BET method. [16]

- Q8)** a) Explain the Langmuir-Hinshelwood model. [8]
- b) What are spinels? State their characteristics. [8]



Total No. of Questions : 6]

SEAT No. :

P4670

[Total No. of Pages : 3

[4860]-38

M.E. (Civil Structures)

STRUCTURAL DESIGN OF CONCRETE BRIDGES

(2008 Pattern) (Elective - I(b)) (Semester - I)

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator and relevant IS codes is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

**Q1)** Write detail notes on with appropriate sketches.

- a) Structural forms of bridge decks. [9]
- b) IRC standards for live load on different road bridges. [8]
- c) Planning of bridges. [8]

**Q2)** Design the culvert with the data : [25]

Clear span of the culvert = 5.6m.

Clear carriage way width = 7.5m

Size of kerb = 150mm × 600mm

Average thickness of wearing coat 100mm

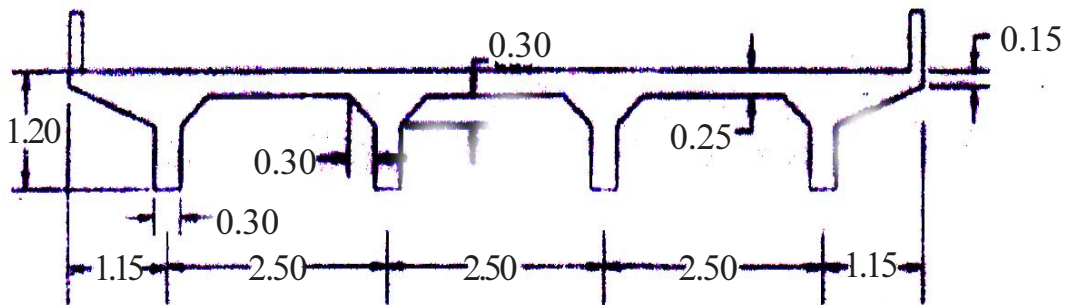
Use material M20, Fe500

Loading class AA

Draw the cross section showing details of reinforcement at mid-span and at junction of the slab are kerb.

**P.T.O.**

- Q3)** Design slab, cross girder and main girder of RCC T-beam and slab girder deck for the crossing of a national highway. The cross section is as shown in figure 1. Consider interior panel of the deck slab. Place the loads so as to produce critical SF and BM in the deck slab and girder. Draw neat sketches showing details of reinforcement in plan and elevation. Take the spacing of cross girders as 3 m C/C. Use M25 Fe 500. [25]



**SECTION - II**

- Q4)** a) Differentiate between rigid frame bridges and simply supported bridges with appropriate explanatory sketches. [8]  
 b) Describe different factors affecting the design of rigid frame bridge. [8]  
 c) Necessity and function of expansion joint. [9]

- Q5)** Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data : [25]

Maximum vertical load = 900 kN

Dynamic vertical load = 90 kN

Transverse lateral load = 40 kN

Longitudinal load = 50 kN

Longitudinal total translation = 12 mm

Rotation at support = 0.003°

Shear modulus of elastomeric bearing = 1.2 N/mm<sup>2</sup>

Allowable comp. Stress for concrete = 8 N/mm<sup>2</sup>

Allowable comp. Stress for elastomer = 10 N/mm<sup>2</sup>

**Q6)** Design wall type RCC pier for the following :

**[25]**

Top width of pier = 1 m with semicircular ends

Length of pier = 6m excluding the semicircular part

Height of above footing = 10 m

HFL above the top of footing = 8 m

Total DL Reaction = 1800 kN

Total LL Reaction = 1200 kN

Tractive force = 120 kN

C/C distance of bearing on either side of centre line of pier = 1 m

BM in traffic direction due to unequal DL & LL = 600 kN-m

Material of pier and footing = M35 & Fe 500

Safe bearing capacity = 180 kN/m<sup>2</sup>

Velocity of water current = 3 m/s consider the cross current also

Design the RCC footing and reinforcement in pier, check the stresses at the bottom of pier.



Total No. of Questions : 8]

SEAT No. :

**P4163**

**[4860]-381**

[Total No. of Pages : 3

**M.E. (Chemical Engineering)**

**c-MATHEMATICAL METHODS IN CHEMICAL ENGINEERING  
(2008 Course) (Theory) (Elective-III) (Semester-II) (509111)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from each Section.*
- 2) Answers to the two Sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

**SECTION-I**

**Q1)** The operation of isothermal plug flow reactors in which CO, NO, O<sub>2</sub> (in automotive exhaust) reacts catalytically (iridium and rhodium). The dimensional equations, in the absence of diffusional limitations, can be written as

$$\frac{\partial y_1}{\partial t} = kR(1 - y_1)(1 - y_2) + (S - R)(1 - y_1)y_1$$

$$\frac{\partial y_2}{\partial t} = k(1 - y_1)(1 - y_2)$$

$$\frac{\partial y_3}{\partial t} = -(1 - y_1)y_3$$

With  $y_0 = [0, 0, 1]$ ,  $y_1$ ,  $y_2$  and  $y_3$  are the conversion of CO, NO and O<sub>2</sub> respectively and  $t$  is dimensionless reactor length. Integrate these for the parameters values (upto  $t = 1$ )  $k = 2$ ,  $R = 0.33$ ,  $S = 0.3$ . Use suitable method for solving equation. Do the calculation up to one iteration. **[16]**

**P.T.O.**



**Q2) a)** Find the Eigen values and Eigen vector of following matrix

$$\begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix} \quad [9]$$

b) Using the Gauss elimination method for solving equations

$$5x + 13y + 7z = 14$$

$$3x + 6y + 3z = 9$$

$$7x + 2y + 4z = 5 \quad [9]$$

**Q3) a)** What are various applications of tensors and matrices in chemical engineering. Explain with suitable examples in the field of chemical engineering. [8]

b) What are properties of tensors and tensor products? [8]

**Q4)** Solve for  $u(r)$ , using the Green's function

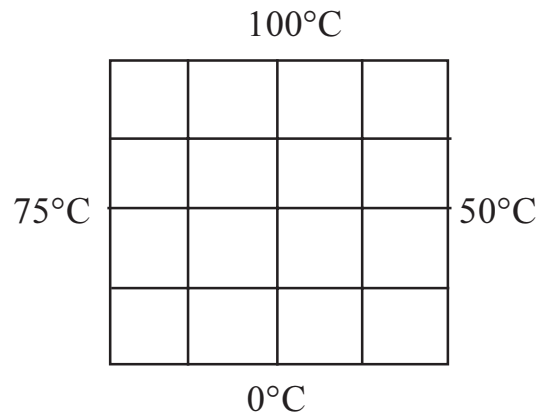
$$\frac{1}{r} \left( \frac{\partial}{\partial r} r \frac{\partial u}{\partial r} \right) = r^2 \quad 0 < r < 1$$

Subject to  $u(r=0)$  is bounded

$$u(r=1) = 1 \quad [16]$$

## SECTION-II

**Q5) a)** Use Liebmann's method to solve for the temperature of heated plate with lower edge insulated in figure shown below. Solve for two iterations. [10]



b) Differentiate between regular and singular perturbation. [8]

**Q6)** a) Write short note on stochastic simulation techniques. [8]

b) Write any models for Reaction Diffusion phenomena and explain solution methodology for solving these models. [8]

**Q7)** Use direct approach finite element method to generate matrix equation that describe the behavior of rod. The rod is made of 10 cm length with boundary conditions of  $T(0, +) = 40$  and  $T(L, +) = 200$  and uniform heat source of  $f(x) = 10$ . The equation for the same is  $d^2T/dx^2 = -10$ . [16]

**Q8)** Apply the finite difference technique and the Crank-Nicholson method to the dimensionless diffusion equation [16]

$$\frac{\partial C}{\partial t} = \frac{\partial^2 C}{\partial x^2}$$

Subject to  $C(0, t) = C(1, t) = 0$ ;  $C(x, 0) = 1$ .



Total No. of Questions : 8]

SEAT No. :

**P4164**

**[4860]-383**

[Total No. of Pages : 2

**M.E. (Chemical Engineering)**

**CATALYSIS AND SURFACE PHENOMENA**

**(2008 Course) (Open Elective) (Semester-II) (509112)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two Sections should be written in separate answer books.*
- 2) *Answer any three questions from Section-I and any three questions from Section-II.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) Differentiate between the functioning of homogeneous and heterogeneous catalysis. [6]
- b) Write about importance of surface area measurement in catalyst. [6]
- c) What is the role of promoter and inhibitor in a catalytic process? Give examples. [6]
- Q2)** a) Explain the functioning of enzymes as a catalyst with example. [8]
- b) Explain Eely Riedel mechanism. [8]
- Q3)** a) What are adsorption isotherms? Explain Langmuir and Freundlich isotherms. [8]
- b) Explain Tempkin model. [8]

**P.T.O.**

- Q4)** a) Describe a method for determining the surface area of a catalyst. [8]  
b) Describe any two methods of catalyst characterization. [8]

### SECTION-II

- Q5)** a) Derive the effectiveness factor for a flat plate catalyst pellet. [10]  
b) Explain in detail the different ways of catalyst deactivation. [8]
- Q6)** a) Explain any one model for catalyst deactivation in detail. [8]  
b) How is catalyst regeneration carried out? [8]
- Q7)** a) What are zeolites? Write about their catalytic activity in detail. [8]  
b) Explain the methanol synthesis process in detail. [8]
- Q8)** a) Explain the effect of external transport on catalyst selectivity. [8]  
b) Explain the phenomenon of catalyst sintering. [8]



Total No. of Questions : 8]

SEAT No. :

**P4165**

**[4860]-384**

[Total No. of Pages : 2

**M.E. (Chemical)**

**b-PROCESS OPTIMIZATION**

**(2008 Pattern) (Theory-Elective-IV Open) (Semester-II) (509112)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer total 3 questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

**SECTION-I**

**Q1)** Minimize  $f(x) = x^4 + (2/(2+x^2)) + (5/(3+x^3))$ . Use Interval halving method. Write complete algorithm for this method and demonstrate at least 3 steps towards finding optimized solution for the above function. Do not try to solve it completely. **[17]**

**Q2)** Minimize  $f(x) = 10x^5 - 2x^4 + 5x + 40$  in the interval  $[-8 \ 8]$ . Use Secant Method. Write complete algorithm for this method and demonstrate at least 3 steps towards finding optimized solution for the above function. **[17]**

**Q3)** A typical batch reactor is example of set of ordinary differential equations (eg. ODEs generated for molar balance, energy balance). The typical constraints on such a problem are of physical type based on dimensions of units, of system type based on the physicochemical considerations. Considering above, construct a problem around a batch reactor and identify the objective function, constraints. Also discuss the strategy to get optimized solution out of it. **[16]**

**Q4)** Write short notes (Any Three): **[16]**

- a) Sensitivity Analysis.
- b) Design Parameters.
- c) Nonlinear constraints.
- d) Concavity Vs Convexity of a function.

**P.T.O.**

## SECTION-II

**Q5)** Maximize  $f(x) = (x_1 - 5)^2 + (x_2 - 2)^2$

Subject to linear constraints

$$x_1 \geq 0, x_2 \geq 0, 5 - x_1 - x_2 \geq 0, -2.5 + x_1 - x_2 \leq 0 \quad [17]$$

**Q6)** Explain the Simplex Search Method and demonstrate for minimization of  $f(x) = x_1^2 + x_2^2 + 3$  starting at  $(x^0)^T = [2 \ 1]$  in the direction  $s^0 = [-2 \ -2]^T$ . Perform 4 steps. [17]

**Q7)** State various conditions of definiteness of a function using Hessian matrix. Find whether the following function is strictly convex/strictly concave.

$$f(x) = 5x_1^2 + 7x_1x_2 + 10x_1 + 5x_2 - 9x_2^2 + 4 \quad [16]$$

**Q8)** Write short notes (Any Three) [16]

- a) Linear Programming.
- b) Necessary Conditions.
- c) Quadratic programming.
- d) Multivariable Optimization.



Total No. of Questions : 8]

SEAT No. :

**P4166**

**[4860]-387**

[Total No. of Pages : 2

**M.E.(Environmental)  
ENVIRONMENTAL GEOSCIENCES  
(2008 Course)( Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each Section.*
- 2) *Answers to the two Sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION-I**

**Q1)** Discuss about Desert Ecosystem and ocean Ecosystem in detail. **[16]**

**Q2)** What EL-Nino? Explain its effects. **[16]**

**Q3)** What are the causes of volcanicity? Explain extrusive volcanism. **[16]**

**Q4)** Write notes on: **[18]**

- a) Hydrosphere of the Earth.
- b) Energy budget of earth.

**SECTION-II**

**Q5)** What is Acid mine Drainage? Explain its effects on environment in detail. **[16]**

**P.T.O.**

**Q6)** Explain the application of GIS in Environmental Engineering with suitable example. **[18]**

**Q7)** Explain the magmatic deposits and sedimentary deposits in detail. **[16]**

**Q8)** Write short notes on: **[16]**

- a) Imbalance of trace elements.
- b) Geochemical cycle.





Total No. of Questions : 8]

SEAT No. :

**P4167**

**[4860]-388**

[Total No. of Pages : 2

**M.E. (Environmental)  
ENVIRONMENTAL CHEMISTRY  
(2008 Course) (Semester-I) (509133)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each Section.*
- 2) Answers to the two Sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION-I**

**Q1)** Discuss the soil pollution by mining. **[16]**

**Q2)** What are surfactants and pesticides? Give their classification? Also discuss their effects on environment. **[16]**

**Q3)** Explain soil sampling and its analysis in detail. **[16]**

**Q4)** Write notes on: **[18]**

- a) Classification of Enzymes.
- b) Synthesis of DNA & RNA.

**SECTION-II**

**Q5)** Explain the principle & working of Atomic Absorption spectrophotometer in detail. **[16]**

**P.T.O.**

**Q6)** What is BOD? Explain the method of its determination in detail. **[16]**

**Q7)** Explain Isotope dilution Analysis & Neutron activation analysis. **[16]**

**Q8)** Write short notes on: **[18]**

- a) Ion Exchange chromatography.
- b) Polarography.



Total No. of Questions : 8]

SEAT No. :

**P4168**

**[4860]-389**

[Total No. of Pages : 2

**M.E. (Environmental Engineering) (Chemical)**  
**a-MODELING OF ENVIRONMENTAL SYSTEMS**  
**(2008 Course) (Semester-I) (Elective-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from each Section.*
- 2) Answers to the two Sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right side indicate full marks.*
- 5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION-I**

**Q1) a)** Give classification of Environmental systems. **[8]**

b) What are modeling objectives. **[8]**

**Q2) a)** How numerical methods are important in environmental systems. **[8]**

b) What is model calibration. **[8]**

**Q3)** Explain reaction type and order of reaction related to conservation of mass. **[18]**

**Q4) a)** What are Urban diffusion models. **[8]**

b) What is model calibration. **[8]**

**P.T.O.**

## SECTION-II

**Q5)** Explain sensitivity analysis in detail with suitable case study. [18]

**Q6)** a) Explain climate change related to modeling. [8]

b) Explain DO modeling. [8]

**Q7)** Explain prediction of fate of organism and toxic substances. [16]

**Q8)** a) What are models for management applications. [8]

b) Explain lake hydrodynamics. [8]



Total No. of Questions : 6]

SEAT No. :

P3971

[Total No. of Pages : 2

[4860] - 39

**M.E. (Civil Structures) (Semester - I)**  
**DESIGN OF COMPOSITE CONSTRUCTION**  
**(Elective - I (c)) (2008 Pattern)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Compare provisions in India, BS & Euro code with reference to flexural behavior of composite used in construction. [9]
- b) Explain structural elastic behavior of Composite Beam. [8]
- c) Write design philosophy of composite construction. [8]
- Q2)** a) Explain types of sheeting used for composite construction; Explain its utility with suitable example, engineering applications, its material properties. [10]
- b) Explain structural behavior of composite sheets for flexure, longitudinal shear, longitudinal slip, deflection, vertical shear. [15]
- Q3)** a) Explain and compare behavior of concrete filled column under axial load with different section. [15]
- b) What is profiled decking system, state its advantage, what are the steps in design of profiled decking. [10]

**P.T.O.**

## SECTION - II

- Q4)** a) Explain concept of composite truss, explain its advantages and disadvantages. [8]
- b) Explain design of connectors used in composite truss. [9]
- c) Draw structural arrangement in composite truss with details of connectors. [8]
- 
- Q5)** a) How the fire protection is taken care of in composite construction? [8]
- b) What is geometric imperfections, why they are induced, How are they are eliminated in composite construction. [8]
- c) Sketch typical composite foundation showing important connection details. [9]
- 
- Q6)** a) Sketch typical composite bridge deck slab and detail it with all the necessary data. [8]
- b) Write design steps of composite beam with all necessary checks as per codal provisions. [8]
- c) Design composite simply supported beam of span 6 meters to carry load 10 KN/m. Use composite constructions. Select appropriate constituents for composite construction. Assume their appropriate properties for design. Apply suitable code provisions and checks. [9]



Total No. of Questions : 8]

SEAT No. :

**P4169**

**[4860]-392**

[Total No. of Pages : 1

**M.E. (Environmental)**

**d-AIR AND NOISE POLLUTION CONTROL  
(2008 Pattern) (Semester-I) (Elective-I) (509134)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from each Section.*
- 2) Answers to the two Sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*
- 5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.*

**SECTION-I**

- Q1)* Define air pollution and discuss the different sources of air pollutants in detail. [16]
- Q2)* Explain primary and secondary air pollutants with example. [16]
- Q3)* Explain photo chemical smog and coal-induced smog. [16]
- Q4)* Explain the effect of air pollution on human beings and materials. [18]

**SECTION-II**

- Q5)* Sketch and explain different kinds of plumes depending upon different environmental conditions. [16]
- Q6)* What is Inversion? Explain different types of inversions. [16]
- Q7)* Define noise. Discuss in brief the various sources of noise. Write a brief note on noise abatement and control. [18]
- Q8)* With a neat sketch, describe the methods of gaseous sampling by sampling train. [16]



Total No. of Questions : 8]

SEAT No. :

**P4170**

**[4860]-393**

[Total No. of Pages : 2

**M.E. (Chemical) (Environmental Engg.)**

**a-MEMBRANE TECHNOLOGY IN ENVIRONMENTAL ENGINEERING  
(2008 Course) (Semester-I) (Elective-II) (509135)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two Sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) Explain conventional filtration and membrane filtration process. How Membrane separation processes are classified? [6]
- b) Explain Industrial applications of membrane processes. [6]
- c) Discuss essential features of membrane process. [6]
- Q2)** a) Explain controlling factors for the selection of polymers for the membrane preparation. [8]
- b) Explain phase inversion process on a ternary diagram. [8]
- Q3)** a) Explain how performance of a membrane is determined? [8]
- b) Explain classification of separation processes with suitable examples. [4]
- c) Explain the use of non porous membranes. [4]

**P.T.O.**



**Q4)** Write short notes on the following: [16]

- a) Surface properties of membranes.
- b) Necessity of modules.
- c) Charged membranes.
- d) Polymer coating process.

### **SECTION-II**

**Q5)** a) Explain Symmetric and Asymmetric membranes. How interfacial polymerization is used for the preparation of composite membrane? [6]

b) Explain Sol-Gel Process for inorganic composite membrane. [6]

c) Explain dead-end operation and cross flow operation. What is a 'tapered design' of modules in system? [6]

**Q6)** a) Explain how demixing time controls the membrane morphology. [6]

b) Define a phase and explain the preparation of glass membrane by phase separation. [5]

c) Various methods used for membrane preparation. [5]

**Q7)** a) Explain the crystallization, gelation and vitrification process for the polymer membranes. [8]

b) Which are the driving forces are used in membrane processes? Explain with suitable examples. [8]

**Q8)** Write short notes on the following: [16]

- a) Osmosis and reverse osmosis.
- b) Membrane reactors.
- c) Liquid membranes.
- d) Purification of Sea water.



Total No. of Questions : 8]

SEAT No. :

**P4171**

[Total No. of Pages : 2

**[4860]-395**

**M.E. (Environmental Engineering-Chemical Engineering)**

**AGRICULTURAL POLLUTION AND CONTROL**

**(2008 Pattern) (Semester - I) (509135) (Elective-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Figures to the right indicate full marks.*
- 2) *Use of programmable calculator is not allowed.*
- 3) *Draw a neat sketch wherever necessary.*
- 4) *Make necessary assumptions where required.*
- 5) *Answers any three questions from section I and any three Questions from Section-II.*

**SECTION-I**

- Q1)** a) Explain in details Root zone treatment. [9]  
b) Discuss in details about Recycle and Reuse of process of agricultural waste. [9]
- Q2)** a) Explain with neat sketch the biotrickling filter for air pollution control. [8]  
b) Give example of any one organic fertilizer and explain manufacturing of it. [8]
- Q3)** a) Explain in detail any two soil conservation techniques use currently. [8]  
b) Discuss about water logging. How it can be controlled? [8]
- Q4)** a) Discuss about process of recycle and reuse of wastewater for agricultural use. [8]  
b) Explain in details membrane technology. [8]

**SECTION-II**

- Q5)** a) Comment on appropriate management plan for curbing agricultural pollution. [8]  
b) What are the remedial measures to rejuvenate water logged area? [8]
- Q6)** a) Give in tabular form water requirements and favorable climatologically conditions. [9]  
b) State various soil conservation techniques. Explain any two. [9]

**P.T.O.**

**Q7)** a) Explain how bioremediation is a better mode of treatment for agricultural pollution. [8]

b) Explain in detail virtual water understanding with respect to crop suitability. [8]

**Q8)** Discuss in details: [16]

a) Suitability of vermin-composting for agricultural area.

b) Anaerobic digestion and its importance to agricultural area.



Total No. of Questions : 8]

SEAT No. :

**P4172**

[Total No. of Pages : 2

**[4860]-396**

**M.E. (Environmental Engineering) (BOS-Chemical)**

**d-ENVIRONMENTAL IMPACT ASSESSMENT & ECONOMICS**

**(2008 Pattern) (Semester - I) (509135) (Elective-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Attempt any six questions.*
- 2) Figures to the right side indicate full marks.*
- 3) Illustrate your answers with suitable examples and diagrams, wherever necessary.*
- 4) Write relevant question number before writing the answer.*

- Q1)** a) Discuss aims and concept of getting Environmental Impact Assessment done before start of any project? What are its necessity in today's industry context? [8]
- b) Discuss how prediction and assessment of impact on air and water is done in EIA studies. [8]
- Q2)** a) What is importance of public participation in environment decision making. Discuss with suitable example. [8]
- b) Discuss the economics involved of pollution control. What are the important factors which governs this economics? [8]
- Q3)** a) Discuss the details of environmental impact of mining and atomic power stations. [10]
- b) Discuss the details of environmental impact of rail roads and highways. [8]
- Q4)** a) Discuss the environmental impact of tourism (Hotels, beaches and resorts). [8]
- b) Discuss the economic operations concern with different environmental issues. How adversities on economics are observed? [8]

**P.T.O.**

- Q5)** a) Discuss the issue related to 'Lavasa Lake city' with respect to its impact on environment. [8]  
b) What is meaning of price rationing? What are the charges and subsidies are involved in it? Discuss with example. [10]
- Q6)** a) Elaborate on pollution taxes. What do you mean by efficiency properties of a tax on emissions? [8]  
b) What do you understand by Carbon credit? How it is win win situation for both developed and developing countries? [8]
- Q7)** a) Discuss important highlights of WTO agreement on environment. [8]  
b) Write in details about international organizations for environmental protection and their roles and responsibilities. [8]
- Q8)** a) Discuss the procedure of getting tradable pollution permit. [8]  
b) Discuss in details about the current national and international scenario on agrochemical based pollution. [8]



Total No. of Questions : 8]

SEAT No. :

**P4173**

[Total No. of Pages : 2

**[4860]-397**

**M.E. (Environmental Engineering) (BOS-Chemical)**

**WASTE WATER TREATMENT AND DESIGN**

**(2008 Course) (Semester - II) (Course Code: 509138)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Illustrate your answers with suitable examples and diagrams, wherever necessary.*
- 6) *Assume suitable data, if necessary.*
- 7) *Write correct question number before writing the answer.*

**SECTION-I**

- Q1)** a) Discuss the principles of selection of any process for waste water treatment. [8]  
b) Explain the two film theory of mass transfer. [8]
- Q2)** a) Discuss the importance of coagulation process in treatment of waste water? Discuss various coagulants organic and natural which are used in treatment. Explain the mechanism of coagulation for suspension destabilization. [8]  
b) Why mixing in waste water treatment is considered very important? What are waste water treatment processes in which mixing is generally used?[8]
- Q3)** a) Discuss various important filtration processes in waste water treatment. Discuss operation of slow sand, rapid sand and dual media filters. [9]  
b) Write importance of adsorption process in waste water treatment and discuss types of adsorption in details. [9]
- Q4)** Write short notes on:  
a) Hardness and TDS removal methods [4]  
b) Ion exchange process [4]  
c) Dual media filters [4]  
d) High rate clarification [4]

***P.T.O.***

## SECTION-II

- Q5)** a) Discuss objectives and fundamental of biological treatment processes? [8]  
b) What are the different criteria for the selection of adsorbents? [8]
- Q6)** a) Which are the different biological treatment technologies used for waste water treatment? Explain the conventional activated sludge process for waste water treatment. [10]  
b) Discuss Up flow anaerobic sludge blanket (UASB) reactor for waste water treatment. What are major challenges associated with UASB reactors? [8]
- Q7)** a) Discuss operation and working of trickling filter. What are the advantages of trickling filters over other conventional reactors? [8]  
b) What are the characteristics of an ideal disinfectant? [8]
- Q8)** Write short notes on:
- a) Overview of anaerobic reactors. [4]
  - b) Membrane Bioreactor. [4]
  - c) Types of corrosion [4]
  - d) Ion exchange softener [4]



Total No. of Questions : 8]

SEAT No. :

**P4174**

[Total No. of Pages : 2

**[4860]-399**

**M.E. (Environmental Engineering) (Chemical)**

**INDUSTRIAL WASTE TREATMENT**

**(2008 Course) (Semester - II) (509140)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.*

**SECTION-I**

**Q1)** Explain the treatment techniques for removal of the following pollutants from Industrial waste:

- a) Organic Pollutants. [6]
- b) Oil & Grease. [6]
- c) Phosphate. [6]

**Q2)** a) Write short notes Trickling Filters. [8]

b) Explain Tertiary treatments for industrial Wastewater. [8]

**Q3)** What are clean up and cleaner technologies? Explain with proper examples. [16]

**Q4)** Explain the treatment techniques for the removal of Heavy Metals from industrial wastewater with neat flow diagram. [16]

**SECTION-II**

**Q5)** Draw the flow sheet for treatment of sugar waste and focus on its cost benefit analysis with all details. [18]

**P.T.O.**



**Q6)** Define BOD. Explain the procedure to determine BOD. What are the limitations of BOD TEST? **[16]**

**Q7)** Explain the concept, objective, design and cost-benefit analysis of common ETP plant. **[16]**

**Q8)** Write notes on:

a) Flow chart for sludge treatment & disposal. **[8]**

b) Oxidation Pond. **[8]**



Total No. of Questions : 8]

SEAT No. :

**P3952**

**[4860] - 4**

[Total No. of Pages : 2

**M.E. (Civil) (Construction and Management)**  
**NEW CONSTRUCTION MATERIALS**  
**(2008 Pattern) (Elective - I(a))**

*Time :4 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer three questions from Section-I and three questions from Section-II and 18 marks question from each section is compulsory.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagram must be drawn wherever necessary.*
- 5) *Electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** What is high performance concrete? Where is it used? What are its advantages? Which special materials are used to prepare HPC? [18]
- Q2)** What are the characteristics of nuclear radiations? What are their effects? How can these be attenuated? Explain with a detail experimental programme. [16]
- Q3)** a) What are the smart materials? Explain different types and application areas for each. [10]  
b) Explain properties in brief of any 3 construction chemicals. [6]
- Q4)** With respect to CMRB and GFRC explain the following : [18]  
a) Manufacturing process.  
b) Advantages.  
c) Tests to be performed and the expected performance parameters.  
d) Major applications.

***P.T.O.***

## SECTION - II

- Q5)** Which are the various eco-friendly materials? What are their advantages? How is the leed rating decided? How the Government is promoting use of green construction? Explain? [18]
- Q6)** Discuss types of flyash manufacturing process, advantages and limitations as a construction materials based on its physical, chemical properties. [16]
- Q7)** a) Explain in detail Use of nano-technology in construction materials.[8]  
b) Explain in detail Retarders, accelerators. [8]
- Q8)** a) Compare and contrast between steel fibers and carbon fibers as regards their use in FRC. [8]  
b) With a neat labeled sketch explain how the L box test is conducted on SCC. What is the purpose of this test. [8]



Total No. of Questions : 6]

SEAT No. :

P3972

[Total No. of Pages : 2

[4860] - 40

**M.E. (Civil) (Structure) (Semester - I)**

**DESIGN OF FOUNDATION**

**(2008 Pattern) (Elective - I (d))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Your answers will be valued as a whole.*
- 5) *Use of electronic pocket calculator & IS codes are not allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** Explain the following: **[15]**

- i) Proportioning of Footing.
- ii) IS - 1892-1979, provisions for soil exploration.
- iii) USCS.
- iv) Soil Structure Interaction.
- v) Teng's correlations.

b) For a framed structure, a column footing of size 2.5 m x 3m, transmits a pressure increment of 150 kN/m<sup>2</sup>, at its base embedded in sand 1.8 m below GL. Total depth of sand below GL is 3.8m & below it 2m deep clay was found. Assuming 2 V : 1H, pressure distribution, compute the consolidation settlement at the middle of clay layer. Using following data,

- i) For sand,  $\gamma = 19 \text{ kN/m}^3$  &  $\gamma_{\text{sat}} = 23 \text{ kN/m}^3$ .
- ii) For clay,  $\gamma_{\text{sat}} = 20 \text{ kN/m}^3$ ,  $C_c = 0.26$ ,  $w = 40\%$ ,  $G = 2.7$ , GWT @ 2.8m below GL.

**[10]**

**Q2) a)** Explain the design steps, with sample calculations, for **[16]**

- i) Flat slab raft.
- ii) Beam & Raft (slab) foundation.

b) Discuss the conditions favouring the design of different types of raft foundations. **[9]**

**P.T.O.**

- Q3)** a) Discuss the design of foundations for **[15]**
- i) Rotary machines.
  - ii) Impact machines, as per IS-2974 (pt-II) - 1966.
- b) For a block vibration test, resonance occurred at a frequency of 30 cycles/sec, with test block size 1m x 1m x 1m. Determine  $C_u$  if the wt. of oscillator is 900 N & the force produced by it after 15 cycles is 1800 N. Compute the max. Amplitude in the vert. direction at 15 cycles/sec if the wt. of block is 24 kN/m<sup>3</sup>. **[10]**

### **SECTION - II**

- Q4)** a) Compute the settlement of pilegroup in a uniform clay upto a depth of 20m, using following data, **[15]**
- i) Total load = 3000 kN.
  - ii) 'B' of pile cap = 5m,
  - iii)  $L = 10$  m,  $\phi = 0.5$  m &  $q_u = 70$  kN/m<sup>2</sup>,
  - iv) LL = 60%, FOS = 03 for shear.
- b) Explain the following:
- i) Design steps for precast & in-situ piles. **[6]**
  - ii) NSF. **[4]**
- Q5)** a) Explain the steps for design of RCC precast pile with sample calculations & check for handling stresses. **[17]**
- b) Explain the steps for 'Rees & Mat lock Method'. **[8]**
- Q6)** a) Explain the steps for design of pile cap, with sample calculations. **[9]**
- b) Explain different types of 'Shell foundations', stating their suitability & IS code recommendations. **[8]**
- c) Compare Hyperbolic & conical RC shell foundations, with & without edge beams. **[8]**



Total No. of Questions : 8]

SEAT No. :

**P4175**

[Total No. of Pages : 2

**[4860]-400**

**M.E. (Environmental Engineering) (BOS - CHEMICAL)**

**ECOLOGY AND RISK ASSESSMENT**

**(2008 Pattern) (Semester - II) (Elective-III)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Attempt any six questions.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Illustrate your answers with suitable examples and diagrams, wherever necessary.*
- 4) *Write relevant questions number before writing the answer.*

**Q1)** a) How Eco-systems is important from keeping the balance of nature? [8]

b) Discuss the principles pertaining to limiting factors. [8]

**Q2)** a) Discuss importance of Biogeochemical cycles. [8]

b) Discuss how energy in Eco-system is recycled in various forms? [8]

**Q3)** a) Explain the principles and concepts at the community and population levels. [10]

b) What is importance of study of species in ecology? [8]

**Q4)** a) Discuss in detailed about terrestrial ecology. [8]

b) Explain various models of ecology which are in existence. [8]

**Q5)** a) What do you understand by fresh water ecology? [8]

b) Discuss the marine ecology and Estuarine ecology? [10]

**Q6)** a) Discuss the importance of various ecology in sustainable development and biodiversity. [8]

b) What is a habitat? State examples. [8]

*P.T.O.*

- Q7)** a) How the quantification of uncertainty is done? [8]  
b) What do you mean by predictive risk assessment? [8]
- Q8)** a) What are benefits of risk assessment studies? [8]  
b) Discuss the various man made activities which creates the imbalance in to the ecology and its impact on to the nature. [8]



Total No. of Questions : 6]

SEAT No. :

**P4176**

[Total No. of Pages : 1

**[4860]-401**

**M.E. (Environmental)**

**b: WATER QUALITY MODELING**

**(Semester-II) (2008 Course) (509141) (Elective- III)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*
- 5) *All questions are compulsory.*

**SECTION-I**

- Q1)** a) What is modeling?  
b) Explain the steps involved in modeling. **[16]**
- Q2)** a) Write the sources of water pollution.  
b) Explain the type of water pollutants. **[16]**
- Q3)** a) Explain point & Non point solution.  
b) Give the steps involved in mathematical formulation of water quality models. **[18]**

**SECTION-II**

- Q4)** Develop a mathematical model for rate of oxygen uptake in microbial growth. **[16]**
- Q5)** Elaborate modeling treatment for complete mix reactor with reaction. **[16]**
- Q6)** Explain a model for DO oxygen sag analysis. **[18]**





Total No. of Questions : 8]

SEAT No. :

**P4177**

[Total No. of Pages : 2

**[4860]-403**

**M.E. (Environmental Engg. -Chemical Engg.)**

**d: ENVIRONMENTAL BIOTECHNOLOGY**

**(2008 Pattern) (Semester - II) (509141) (Elective-III)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Figures to the right indicate full marks.*
- 2) *Use of programmable calculator is not allowed.*
- 3) *Draw a neat sketch wherever necessary.*
- 4) *Make necessary assumptions where required.*
- 5) *Answers any three questions from section I and any three Questions from Section-II.*

**SECTION-I**

**Q1)** Discuss in details from the following: **[16]**

- a) Environment is both physical and biological.
- b) Trickling filters.

**Q2)** a) What does industrial microbiology mean? Give its importance. **[8]**

- b) Explain the various types of environment which influence the personality of an individual. **[8]**

**Q3)** a) Differentiate between aerobes and anaerobes. **[8]**

- b) What is binary fission? Explain in detail. **[8]**

**Q4)** a) Explain in details any two types of bioremediations. **[9]**

- b) Write short notes on: The Archaea, eubacteria, Eukarya. **[9]**

**SECTION-II**

**Q5)** a) Comment in details on Fermentations and Biotechnology. **[8]**

- b) Give some important definitions of environment as given by different experts. **[8]**

**Q6)** a) Explain the importance of the three Kingdom classification system (Haeckel's) **[8]**

- b) Discuss about bioremediation is a better mode of treatment for pesticides and herbicides pollution. **[8]**

**P.T.O.**

- Q7)** a) Draw and explain treatment flow sheet for fermentation process of any antibiotic product and their applications. [8]  
b) State and different types of bioscrubbers and explain any techniques of air pollution control using it. [8]
- Q8)** a) Explain the classification of bacteria based on Gram reaction. [6]  
b) Discuss about any one Novel methods of pollution control in details. [6]  
c) Define aerobic and anaerobic respiration. [6]



Total No. of Questions : 8]

SEAT No. :

**P4522**

**[4860] - 404**

[Total No. of Pages : 4

**M.E. (Chemical) (Environmental Engg.)**  
**GROUND WATER CONTAMINATION AND POLLUTION**  
**TRANSPORT**

**(2008 course) (Semester - II) (509142) (Elective-IV(Open))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

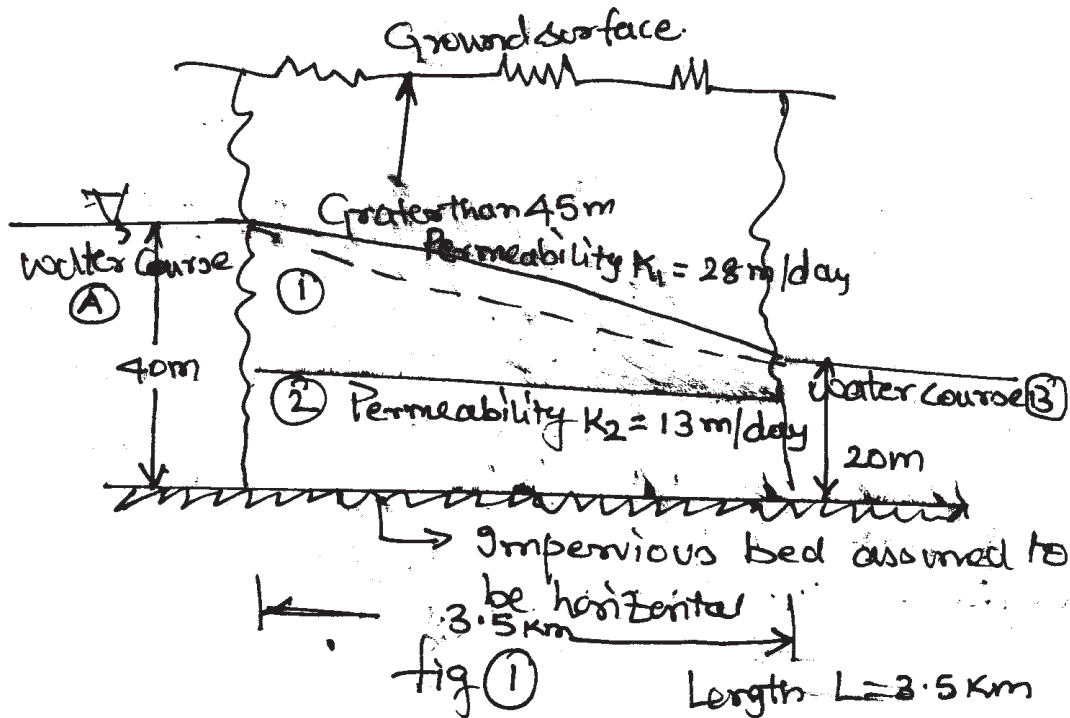
- 1) *Answer any THREE questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume Suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Explain groundwater cycle and hydrologic cycle indicate all shortcuts in the process. **[8]**
- b) Explain the mechanism of groundwater contamination. What are the contribution of the geological media in the groundwater contamination. **[6]**
- c) Explain groundwater subsystem and water profiling. **[4]**
- Q2)** a) What are the various source of groundwater contamination and explain Non point source of groundwater contamination with suitable examples. **[6]**
- b) Explain, Specific Retention and Specific yield. **[4]**
- c) Explain compressibility of aquifer and explain how the compressibility affects the aquifer parameters. Does compressibility of aquifer result in geotechnical problems. **[6]**

**P.T.O.**

- Q3) a) Explain the various factors affecting groundwater movement through geological formation. Explain and derive the Darcy velocity through soil formation. [6]
- b) A land mass separates two water bodies A&B which are running parallel as shown in fig1. Determine the flow from A to B per unit length of water body. [6]



- c) Explain groundwater exploration techniques and its necessity. How do exploration techniques differ for alluvial and hard rock terrains. [4]

- Q4) a) Derive the equation for discharge of steady flow from a well completely penetrating into unconfined aquifer. [6]
- b) Explain flow net as a flow model for determining the discharge through an aquifer. What are the different methods of construction of flow net? Explain how anisotropic formation affects the discharge through flow net. [6]
- c) Derive the tangent law of refraction of groundwater flow in heterogeneous medium. [4]

## SECTION-II

**Q5) a)** Show that the induced recharge into an artesian aquifer is given by

$$Q = \frac{1}{2} q_0 e^{-x/l}$$

Where  $q_0$ =induced recharge and  $x$ =characteristic length of aquifer. [6]

- b) Explain groundwater pollution control and its necessity. List out different methods of pollution control and explain any one method of in-situ chemical treatment of groundwater pollution control. [6]
- c) What are the various groundwater exploration techniques? Explain equilibrium pumping test method for measurement of aquifer parameter. [6]

**Q6) a)** Explain groundwater Modelling as tool for groundwater pollution studies. What are the different types of groundwater models and explain electrical Analogy model. [6]

- b) What are trace materials and how do trace material contribute to groundwater pollution? [4]
- c) Explain with neat sketch groundwater pollution cycle between land and water. [6]

**Q7) a)** Explain the necessity of Artificial Recharge of Groundwater. What are the natural and artificial conditions favourable for artificial recharge? [6]

- b) What are the possible types of groundwater contamination plumes? Discuss Gaussian plume model for groundwater contamination study. [6]
- c) Discuss any two leachate control methods with necessary sketch. [4]

**Q8)** Answer any four of the following.

**[16]**

- a) Salt water intrusion mechanism and methods to control.
- b) Dual permeability approach for groundwater contamination.
- c) Dispersion in fractured rocks.
- d) Land fill and dumping for disposal of solid waste.
- e) Role of Environmental isotopes in the study of groundwater contamination.

ζ ζ ζ

Total No. of Questions : 6]

SEAT No. :

**P4178**

[Total No. of Pages : 1

**[4860]-407**

**M.E. (Petroleum Engineering)**

**HORIZONTAL, MULTILATERAL AND INTELLIGENT WELLS**

**(2008 Course) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) Discuss casing buckling and stability analysis in detail. [9]  
b) Discuss casing grade selection in detail. [9]
- Q2)** a) Discuss geometry of type I directional well in detail. [8]  
b) Describe tripping operation in brief. [8]
- Q3)** a) What is kick? Explain hard shut in procedure with schematic. [8]  
b) Discuss different types of horizontal wells and BHA for build, hold and drop the angle. [8]

**SECTION-II**

- Q4)** Discuss different considerations for drill string design and API classification of drill pipe. [16]
- Q5)** a) Explain two stage cementation in detail. [8]  
b) What are different types of drilling fluids? Explain any one in detail. [8]
- Q6)** a) What is hydraulics? [9]  
b) Discuss power law model of drilling fluid in detail. [9]



Total No. of Questions : 6]

SEAT No. :

P3973

[Total No. of Pages : 2

[4860] - 41

**M.E. (Civil) (Structures) (Semester - I)**  
**ADVANCED DESIGN OF METAL STRUCTURE**  
**(Elective - II (a)) (2008 Pattern)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator and relevant IS codes is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

**Q1)** Suggest structural configuration of hoarding structure to be installed at height of 15 m above ground level. The display board is of dimensions 30 m wide, 8 m height. Calculate the loads due to wind on the members of support structure. Draw free body diagram of structures showing the forces and reactions. **[25]**

**Q2)** Design a castellated beam for a span of 30m subjected to factored UDL of 20 kN.m inclusive of dead load and live load. Assume that compression flange is fully restrained. **[25]**

- Q3)** a) Compare steel and aluminum structural sections and applications. **[10]**
- b) Find flexural and shear stresses in IS ALB 150 at 12.1 kg/m when loaded with udl of 30 KN/m on span of 3.5m. **[15]**

**SECTION - II**

**Q4)** a) Explain with sketches any three types of bracing systems used for lattice towers. **[5]**

**P.T.O.**



- b) Determine the maximum compression and maximum tension in legs of the transmission towers 60m high for following data: [20]

Weight of antenna = 10 kN

Weight of platform at top = 1 kN/m<sup>2</sup>

Weight of railing at top = 0.25 kN/m<sup>2</sup>

Weight of ladder and cage = 0.75 kN/m

Weight of miscellaneous items = 2.50 kN

- Q5) a)** State codal provisions for tubular structures. [10]

- b) A tension member of a truss carrying a tensile force of 75 kN meets a principal rafter carrying a compressive force of 100 kN at 45° angle. The panel length along principal rafter is 2m. Design both the members and welded connection for the same. Consider tubes of grade IS 1161 Grade Yst = 240 and allowable stress in fillet weld as 110 N/mm<sup>2</sup>. [15]

- Q6) a)** Explain types of cold form section and its suitability. [10]

- b) Determine the safe load a hat section 100 mm x 80 mm x 4 mm as lip of 25mm dimension can carry. Consider compression flange heavier as compared to tension flange. The effective length of member is 3m. Determine the safe load a hat section 100 mm x 80 mm x 4 mm as lip of 25 mm dimension can carry. Consider compression flange heavier as compared to tension flange. The effective length of member is 3m. [15]



Total No. of Questions :10]

SEAT No. :

**P4523**

**[4860]-410**

[Total No. of Pages :2

**M.E. (Petroleum)**

**c - OIL AND GAS FIELD DEVELOPMENT**

**(2008 Course) (Semester - I) (Elective - I) (512104)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from section - I and any three questions from section-II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION -I**

- Q1)** Which stages are involved in the process of oil and gas field development?  
Discuss the oil well drilling and production phase in detail. **[18]**
- Q2)** What is reservoir driving mechanism? Describe different reservoir drive mechanisms and their features using graphs of variation in PI , pressure, GOR and IPR. **[16]**
- Q3)** Classify the different types of artificial lift techniques and write the advantages and limitations of each in brief. **[16]**
- Q4)** a) What do you mean by, 'need of additional energy for the pressure maintenance of a reservoir',? Explain. **[8]**
- b) Explain various methods of estimation of hydrocarbon reserves in place. **[8]**
- Q5)** List various pvt properties and explain the importance of well surveys, sample and data collection, laboratory analysis in petroleum industry. **[16]**

**P.T.O.**

## SECTION -II

- Q6)** Discuss in detail, the application of mathematical modeling and simulation in oil field development. **[18]**
- Q7)** Classify and discuss basic principle of different types of enhanced oil recovery techniques. **[16]**
- Q8)** a) Describe the following in brief: **[12]**
- i) Gas field development
  - ii) Reservoir management
- b) Discuss the limitations of marginal field development in brief. **[4]**
- Q9)** Discuss in detail design considerations for surface production facility for an oil field. **[16]**
- Q10)** Write short notes on, **[16]**
- a) Use of scada or dcs.
  - b) Offshore field development.
  - c) Environmental considerations in field development.
  - d) Safety at offshore.

*EEE*

Total No. of Questions : 8]

SEAT No. :

**P4179**

[Total No. of Pages : 4

**[4860]-414**

**M.E. (Petroleum Engineering)**  
**c-WELL TESTING AND ANALYSIS**  
**(2008 Pattern) (Semester - I) (512105) (Elective-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections must be written in separate answer books.*
- 2) *Questions No 2(two) and 8(eight) are compulsory.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Answer 3 questions from section 1 and 3 questions from section II.*
- 5) *Neat diagrams should be drawn wherever necessary.*
- 6) *Use of a non-programmable calculator, log-log, and semi-log paper is allowed.*
- 7) *Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) State the assumptions required to derive the diffusivity equation, and state the significance of each of the equations used for the derivation. [6]
- b) Explain the various flow regimes that are witnessed in a horizontal well test, along with neat diagrams. [10]

**Q2)** Following data is given:

$$q = 30 \text{ stb/d}$$

$$h = 140 \text{ ft}$$

$$B = 1.47 \text{ RB/ STB}$$

$$k = 0.2 \text{ md}$$

$$c_t = 1.4 \times 10^{-5} \text{ psi}^{-1}$$

$$\mu = 0.72 \text{ cp}$$

$$r_w = 0.5 \text{ ft}$$

$$P_i = 3100 \text{ psi}$$

$$\text{porosity} = 20\%$$

$$r_e = 2800 \text{ ft}$$

Calculate the reservoir pressure at the radius of 10 ft, 50 ft, 100 ft and 200 ft after 3 hours of oil production. [18]

**P.T.O.**

- Q3)** a) Explain in detail, the difference between a gas well test and an oil well test. [5]
- b) What are the various objectives of well testing? Write your answer in detail. [5]
- c) What is the impact of well bore storage in well test interpretation? Explain in detail, with appropriate diagrams. [6]
- Q4)** a) What do you mean by DST? Explain with appropriate diagrams, all the phases of a DST? [6]
- b) Derive the continuity equation in radial coordinate system. [10]

## **SECTION-II**

- Q5)** a) What is pseudo pressure?
- b) Explain the difference between isochronal and Modified Isochronal Well test. [16]
- Q6)** How is an exponential curve different from a harmonic and hyperbolic curve? [16]
- Q7)** What do you mean by the E (i) function? Explain its relevance. Write down the types of possible solutions of the diffusivity equation. [16]
- Q8)** Define and explain the pressure derivative plot. Draw and explain the diagnostic plot giving five examples. [18]

Formulas for the exam

For E (i) function values, refer to the table given with the examination paper

$$p = p_i + 70.6 \frac{qB\mu}{kh} \text{Ei} \left( - \frac{948\phi\mu c_i r^2}{kt} \right)$$

$$t_D = \frac{0.000264kt}{\phi\mu_o c_i r_w^2}$$

$$p_{ws} = p_i - \frac{162.6 q_o \mu_o \beta_o}{kh} \log \left[ \frac{t_p + \Delta t}{\Delta t} \right]$$

$$p_D = -\frac{1}{2} \text{Ei} \left( -\frac{r_D^2}{4t_D} \right)$$

$$s = 1.151 \left[ \frac{p_{1hr} - p_{ws}(\Delta t=0)}{m} - \log \left( \frac{k}{\phi\mu_o c_i r_w^2} \right) + 3.23 \right]$$

$$p_{wf} = p_i - \frac{162.6 q_o \mu_o \beta_o}{kh} \left[ \log t + \log \left( \frac{k}{\phi\mu_o c_i r_w^2} \right) - 3.23 + 0.869s \right]$$

$$p = p_i + 70.6 \frac{qB\mu}{kh} \left[ \ln \left( \frac{1,688\phi\mu c_i r^2}{kt} \right) \right]$$

$$\frac{(3.975 \times 10^5)\phi\mu c_i r_w^2}{k} < t < \frac{948\phi\mu c_i r_e^2}{k}$$

$$p_{1h} = p_i + m \left[ \log \left( \frac{k}{\phi\mu_o \beta_o c_i r_w^2} \right) - 3.23 + 0.869s \right]$$

$$p(r,t) = LS(r,t) = p_i - \frac{70.6 Q \mu}{k h} \left[ -\text{Ei} \left( -\frac{948.1 \Phi \mu c_i r^2}{k t} \right) \right]$$

$$k = \frac{162.6 q_o \mu_o \beta_o}{mh}$$

TABLE 1.1—VALUES OF THE EXPONENTIAL INTEGRAL,  $-Ei(-x)$

$-Ei(-x), 0.000 < x < 0.209, \text{interval}=0.001$										
x	0	1	2	3	4	5	6	7	8	9
0.00	+°	6.332	5.639	5.235	4.948	4.726	4.545	4.392	4.259	4.142
0.01	4.038	3.944	3.858	3.779	3.705	3.637	3.574	3.514	3.458	3.405
0.02	3.355	3.307	3.261	3.218	3.176	3.137	3.098	3.062	3.026	2.992
0.03	2.959	2.927	2.897	2.867	2.838	2.810	2.783	2.756	2.731	2.706
0.04	2.681	2.658	2.634	2.612	2.590	2.568	2.547	2.527	2.507	2.487
0.05	2.468	2.449	2.431	2.413	2.395	2.377	2.360	2.344	2.327	2.311
0.06	2.295	2.279	2.264	2.249	2.235	2.220	2.206	2.192	2.178	2.164
0.07	2.151	2.138	2.125	2.112	2.099	2.087	2.074	2.062	2.050	2.039
0.08	2.027	2.015	2.004	1.993	1.982	1.971	1.960	1.950	1.939	1.929
0.09	1.919	1.909	1.899	1.889	1.879	1.869	1.860	1.850	1.841	1.832
0.10	1.823	1.814	1.805	1.796	1.788	1.779	1.770	1.762	1.754	1.745
0.11	1.737	1.729	1.721	1.713	1.705	1.697	1.689	1.682	1.674	1.667
0.12	1.660	1.652	1.645	1.638	1.631	1.623	1.616	1.609	1.603	1.596
0.13	1.589	1.582	1.576	1.569	1.562	1.556	1.549	1.543	1.537	1.530
0.14	1.524	1.518	1.512	1.506	1.500	1.494	1.488	1.482	1.476	1.470
0.15	1.464	1.459	1.453	1.447	1.442	1.436	1.431	1.425	1.420	1.415
0.16	1.409	1.404	1.399	1.393	1.388	1.383	1.378	1.373	1.368	1.363
0.17	1.358	1.353	1.348	1.343	1.338	1.333	1.329	1.324	1.319	1.314
0.18	1.310	1.305	1.301	1.296	1.291	1.287	1.282	1.278	1.274	1.269
0.19	1.265	1.261	1.256	1.252	1.248	1.243	1.239	1.235	1.231	1.227
0.20	1.223	1.219	1.215	1.210	1.206	1.202	1.198	1.195	1.191	1.187
$-Ei(-x), 0.00 < x < 2.09, \text{interval}=0.01$										
x	0	1	2	3	4	5	6	7	8	9
0.0	+°	4.038	3.335	2.959	2.681	2.468	2.295	2.151	2.027	1.919
0.1	1.823	1.737	1.660	1.589	1.524	1.464	1.409	1.358	1.309	1.265
0.2	1.223	1.183	1.145	1.110	1.076	1.044	1.014	0.985	0.957	0.931
0.3	0.906	0.882	0.858	0.836	0.815	0.794	0.774	0.755	0.737	0.719
0.4	0.702	0.686	0.670	0.655	0.640	0.625	0.611	0.598	0.585	0.572
0.5	0.560	0.548	0.536	0.525	0.514	0.503	0.493	0.483	0.473	0.464
0.6	0.454	0.445	0.437	0.428	0.420	0.412	0.404	0.396	0.388	0.381
0.7	0.374	0.367	0.360	0.353	0.347	0.340	0.334	0.328	0.322	0.316
0.8	0.311	0.305	0.300	0.295	0.289	0.284	0.279	0.274	0.269	0.265
0.9	0.260	0.256	0.251	0.247	0.243	0.239	0.235	0.231	0.227	0.223
1.0	0.219	0.216	0.212	0.209	0.205	0.202	0.198	0.195	0.192	0.189
1.1	0.186	0.183	0.180	0.177	0.174	0.172	0.169	0.166	0.164	0.161
1.2	0.158	0.156	0.153	0.151	0.149	0.146	0.144	0.142	0.140	0.138
1.3	0.135	0.133	0.131	0.129	0.127	0.125	0.124	0.122	0.120	0.118
1.4	0.116	0.114	0.113	0.111	0.109	0.108	0.106	0.105	0.103	0.102
1.5	0.100	0.0985	0.0971	0.0957	0.0943	0.0929	0.0915	0.0902	0.0889	0.0876
1.6	0.0863	0.0851	0.0838	0.0826	0.0814	0.0802	0.0791	0.0780	0.0768	0.0757
1.7	0.0747	0.0736	0.0725	0.0715	0.0705	0.0695	0.0685	0.0675	0.0666	0.0656
1.8	0.0647	0.0638	0.0629	0.0620	0.0612	0.0603	0.0595	0.0586	0.0578	0.0570
1.9	0.0562	0.0554	0.0546	0.0539	0.0531	0.0524	0.0517	0.0510	0.0503	0.0496
2.0	0.0489	0.0482	0.0476	0.0469	0.0463	0.0456	0.0450	0.0444	0.0438	0.0432
$-Ei(-x), 2.0 < x < 10.9, \text{interval}=0.1$										
x	0	1	2	3	4	5	6	7	8	9
2	$4.89 \times 10^{-2}$	$4.26 \times 10^{-2}$	$3.72 \times 10^{-2}$	$3.25 \times 10^{-2}$	$2.84 \times 10^{-2}$	$2.49 \times 10^{-2}$	$2.19 \times 10^{-2}$	$1.92 \times 10^{-2}$	$1.69 \times 10^{-2}$	$1.48 \times 10^{-2}$
3	$1.30 \times 10^{-2}$	$1.15 \times 10^{-2}$	$1.01 \times 10^{-2}$	$8.94 \times 10^{-3}$	$7.89 \times 10^{-3}$	$6.87 \times 10^{-3}$	$6.16 \times 10^{-3}$	$5.45 \times 10^{-3}$	$4.82 \times 10^{-3}$	$4.27 \times 10^{-3}$
4	$3.78 \times 10^{-3}$	$3.35 \times 10^{-3}$	$2.97 \times 10^{-3}$	$2.64 \times 10^{-3}$	$2.34 \times 10^{-3}$	$2.07 \times 10^{-3}$	$1.84 \times 10^{-3}$	$1.64 \times 10^{-3}$	$1.45 \times 10^{-3}$	$1.29 \times 10^{-3}$
5	$1.15 \times 10^{-3}$	$1.02 \times 10^{-3}$	$9.08 \times 10^{-4}$	$8.09 \times 10^{-4}$	$7.19 \times 10^{-4}$	$6.41 \times 10^{-4}$	$5.71 \times 10^{-4}$	$5.09 \times 10^{-4}$	$4.53 \times 10^{-4}$	$4.04 \times 10^{-4}$
6	$3.60 \times 10^{-4}$	$3.21 \times 10^{-4}$	$2.86 \times 10^{-4}$	$2.55 \times 10^{-4}$	$2.28 \times 10^{-4}$	$2.03 \times 10^{-4}$	$1.82 \times 10^{-4}$	$1.62 \times 10^{-4}$	$1.45 \times 10^{-4}$	$1.29 \times 10^{-4}$
7	$1.15 \times 10^{-4}$	$1.03 \times 10^{-4}$	$9.22 \times 10^{-5}$	$8.24 \times 10^{-5}$	$7.38 \times 10^{-5}$	$6.58 \times 10^{-5}$	$5.89 \times 10^{-5}$	$5.26 \times 10^{-5}$	$4.71 \times 10^{-5}$	$4.21 \times 10^{-5}$
8	$3.77 \times 10^{-5}$	$3.37 \times 10^{-5}$	$3.02 \times 10^{-5}$	$2.70 \times 10^{-5}$	$2.42 \times 10^{-5}$	$2.16 \times 10^{-5}$	$1.94 \times 10^{-5}$	$1.73 \times 10^{-5}$	$1.55 \times 10^{-5}$	$1.39 \times 10^{-5}$
9	$1.24 \times 10^{-5}$	$1.11 \times 10^{-5}$	$9.99 \times 10^{-6}$	$8.95 \times 10^{-6}$	$8.02 \times 10^{-6}$	$7.18 \times 10^{-6}$	$6.44 \times 10^{-6}$	$5.77 \times 10^{-6}$	$5.17 \times 10^{-6}$	$4.64 \times 10^{-6}$
10	$4.15 \times 10^{-6}$	$3.73 \times 10^{-6}$	$3.34 \times 10^{-6}$	$3.00 \times 10^{-6}$	$2.68 \times 10^{-6}$	$2.41 \times 10^{-6}$	$2.16 \times 10^{-6}$	$1.94 \times 10^{-6}$	$1.74 \times 10^{-6}$	$1.56 \times 10^{-6}$



Total No. of Questions : 8]

SEAT No. :

**P4180**

[Total No. of Pages : 2

**[4860]-417**

**M.E. (Petroleum Engineering)**

**ENVIRONMENTAL MANAGEMENT TECHNOLOGY AND  
SAFETY MEASURES**

**(2008 Course) (Semester - II) (512109)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answers books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) Explain sources of hydrocarbon release into sea. **[6]**  
b) Difference between a “hazardous substance” and an “extremely hazardous substance.” **[6]**  
c) Write a brief note on: NORM in shale. **[6]**  
d) Discuss in details Chemical and Biological methods of oil spill control in marine environment. **[7]**
- Q2)** a) The carbon monoxide (CO) concentration in the stack from a solid hazardous waste treatment facility is measured at 22 ppm at a temperature of 175°F. The oxygen concentration in the stack is measured to be 12% by volume on a wet basis. The water content of the stack gas is 16 mol % **[15]**  
i) What is the corrected CO content in the stack gas?  
ii) Similarly, the particulate concentration in the stack is measured at 22 mg/dscf at a stack oxygen concentration of 10% on a dry basis at 700 °F. What is the corrected particulate concentration?
- b) What are environmental air quality monitoring parameters? Explain the equipment used for the purpose. **[10]**

**P.T.O.**



- Q3)** a) Explain allowable limits for disposal of wastewater on to the land, in to sea and river as per the IS standards? Discuss in brief the effects if these limits are crossed. [15]
- b) What are the different chemicals used in bulk in drilling muds. How do they affect the environment? What are the methods of limiting their impact on environment? [10]
- Q4)** a) What is CO<sub>2</sub> sequestration? Describe the role of petroleum industry in CO<sub>2</sub> sequestration. [15]
- b) A typical city of 55,000 people has a wastewater treatment discharge of 9.2 million gal/day (MGD) and a BOD<sub>5</sub> in the raw wastewater of 225 mg/L. [10]
- i) What is the total discharge of BOD in lb/day?
- ii) What is the BOD<sub>5</sub> discharge in lb/person per day?

### **SECTION-II**

- Q5)** Discuss the protocol for field investigation of a contaminated site, assuming the contaminations due to spilled petroleum products. Support your discussion by considering the following: [25]
- a) Levels of protection,
- b) Work zone control, and
- c) Knowledge of safety procedures.
- Q6)** a) Write a note on “Accidents in oil industry and environmental degradation”. [15]
- b) Differentiate between a point source and dispersed source of pollutants? Give examples of each. [10]
- Q7)** Write notes on: [25]
- a) Disaster management in Oil and Gas Industry.
- b) Toxicity of petroleum products and treatment chemicals.
- c) Petroleum site assessment for environment impact.
- Q8)** Describe various types of audits involved in environment management of oil industry. How do they incorporate legal, ethical, social, and political issues? [25]



Total No. of Questions :10]

SEAT No. :

**P4524**

**[4860]-419**

[Total No. of Pages :2

**M.E. (Petroleum)**

**ARTIFICIAL LIFT TECHNIQUES**

**(2008 Course) (Semester - II) (Elective - III(a)) (512111)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from section - I and section-II each.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, Slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION -I**

**Q1)** What is Artificial lifting? Discuss the working of Continuous gas lift, Intermittent gas lift and SRP in brief. **[18]**

**Q2)** Discuss usability of gas lifting, SRP and jet pump only in terms of excellent/ good/ fair/poor in a tabular form for following well conditions. Low PI, Low GOR, adaptability to deviated wells, capability to produce sand and high volume lift capability. **[16]**

**Q3) a)** Draw neat schematic sketch of surface and subsurface components of an ESP and indicate them. **[8]**

b) Draw the schematic sketch and explain any one type of gas lift valve. **[8]**

**Q4) a)** Which method or methods of artificial lifting you will propose for the following requirements and Why? Write in brief. **[8]**

i) Offshore oil production with high GOR.

ii) High PI, high production rate wells.

b) Write and explain the procedure to decide, depth of point of gas injection in case of continuous gas lift. **[8]**

**P.T.O.**

- Q5)** a) Explain, optimum GLR and liquid fall back. [8]  
b) Describe various types of multiphase flow regimes in detail. [8]

### **SECTION -II**

- Q6)** Draw neat schematic sketch of surface and subsurface set up of Sucker rod pumping system and write functions of different components of it. [16]
- Q7)** What is workover operation? Describe any four workover problems and solution for them in brief. [18]
- Q8)** Describe various methods of well stimulation in detail. [16]
- Q9)** What is nodal analysis? Discuss it in detail, along with examples. [16]
- Q10)** Write short notes on, [16]
- a) Formation damage.
  - b) Production optimization.
  - c) Plunger lift.
  - d) Productive formation testing.

*EEE*

Total No. of Questions : 6]

SEAT No. :

**P4461**

**[4860]-42**

[Total No. of Pages : 2

**M.E. (Civil) (Structures)**

**STRUCTURAL DESIGN OF STEEL BRIDGES  
(2008 Course) (Semester-I) (Elective-II) (501405)**

*Time : 4 Hours]*

*[Max. Marks : 100*

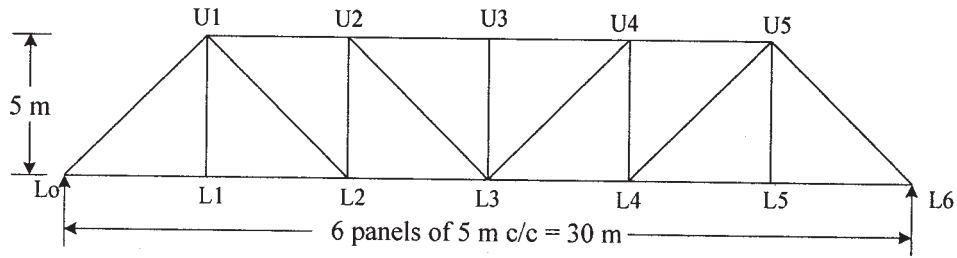
*Instructions to the candidates:*

- 1) *Attempt any two questions from Section I and II.*
- 2) *Answers to the two Sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams should be drawn wherever necessary.*
- 5) *If necessary, assume suitable data.*
- 6) *Use of electronic pocket calculator, relevant IS code and steel table are allowed.*

**SECTION-I**

- Q1)** a) Explain in details, classification of steel bridges as per main load carrying element. [8]
- b) State and explain different factors for the selection of type of steel bridges. [9]
- c) State and explain design consideration of longitudinal and lateral forces for highway and railway steel bridges. [8]
- Q2)** a) Explain type of floor system for plate girder railway bridge. [5]
- b) A deck type plate girder railway bridge of span 24 m is provided for a single broad gauge track. The overall depth of the plate girder is 2050 mm. the depth of sleeper and rail section is 400 mm. Spacing of main girder is 2.1 m. Design horizontal truss bracing and cross frame for plate girder bridge using angle section. [20]
- Q3)** a) Draw the sketch showing different component of through type truss girder railway steel bridge. [5]
- b) A through type railway truss girder bridge consists of two Pratt trusses as shown in Fig. 3 b. The bridge supports an equivalent uniformly distributed live load 125 kN/m. The dead load transmitted to each truss inclusive of self weight is 20 kN/m. Draw the influence line diagram and find force in members  $U_2U_3$ ,  $U_2L_3$ ,  $L_2L_3$  and  $U_3L_3$ . Assume the impact factor to be 15%. [20]

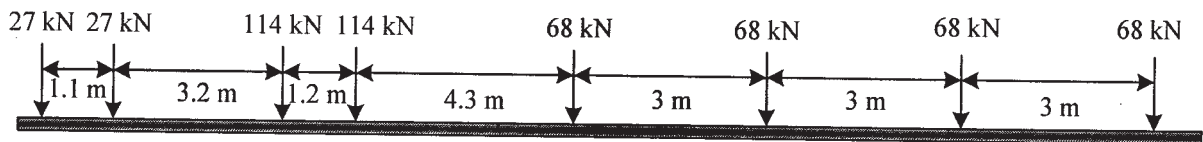
**P.T.O.**



**Fig. 3 b**

**SECTION-II**

**Q4)** The effective span of a deck type plate girder two lane highway bridge is 30 m. The reinforced concrete slab is 250 mm thick inclusive of the wearing coat. The foot paths are provided on either side of the carriage way. Design the maximum section of plate girder, if the bridge is to carry IRC class A loading as shown in Fig. 4. **[25]**



**Fig. 4**

**Q5)** The effective span of through type truss girder highway two lane bridge is 24 m. The reinforced concrete slab is 250 mm thick inclusive of the wearing coat. The foot paths are provided on either side of the carriage way. The spacing between centre to centre of truss girder is 12 m. The highway bridge is to carry IRC class A standard loading. Suggest a suitable truss girder for the bridge. Design the central top chord and diagonal members of the central panel. **[25]**

**Q6) a)** State and explain type of rocker bearing in steel bridges with sketches. **[10]**

b) The effective span of truss girder through type bridge for a single broad gauge track is 30 m. Reaction due to dead load, live load and impact load is 1500 kN. Vertical reaction due to wind is 250 kN. Tractive force is 476 kN and breaking force is 600 kN. Design the rocker bearing and draw design sketch. **[15]**



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 3

**P4181**

**[4860]-421**

**M.E. (Petroleum Engineering)**

**C - PIPING DESIGN AND ENGINEERING**

**(2008 Course) (Elective - III) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer Any Two Questions from each Section.*
- 2) Answer to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data if necessary.*

**SECTION - I**

**Q1)** A 150 NB schedule 40 pipe (OD = 168.28 mm) is employed to gaseous products at 35 bar pressure. Material of construction is carbon steel with safe stress value of 875 kg/cm<sup>2</sup> at the operating temperature. Joint efficiency factor = 85% and corrosion allowance = 1 mm. The other data are given as follows:

- i) Weight of empty pipe = 32 kg per meter.
- ii) Weight of pipe, full of water = 50 kg per meter.
- iii) Moment of Inertia for 150 NB, schedule 40 pipe (I) = 1178 cm<sup>4</sup>.
- iv) Section Modulus (z) = 145 cm<sup>3</sup>.
- v) E = 2.4 × 10<sup>6</sup> kg/cm<sup>2</sup>.

Calculate the following:

- a) Longitudinal tensile stress due to internal pressure.
- b) Safe support span (weight of gaseous products being small can be ignored).

***P.T.O.***

- c) Safe span if same pipe is employed for water service at the same temperature.
- d) Above pipe, as employed for water service is to be provided a slope (gradient) to prevent water pockets in pipe. What should be gradient, if the actual span provided is 12 m. [25]

**Q2) a)** Discuss the various codes, standards and recommended practices related piping design in oil and gas sector. Discuss also most commonly Indian standards referred for oil and gas pipeline design. [15]

- b) Discuss with neat sketches the flow patterns and flow regimes in multiphase mixtures. [10]

**Q3) a)** A 12" (300 mm) NB pipe has an internal maximum operating pressure of 500 psig (35 kg/cm<sup>2</sup>/g) and temperature 350°C. The material of construction of the pipe is seamless carbon steel to ASTM A 106 GrB. The recommended corrosion allowance is  $\frac{1}{8}$ " (3mm). Calculate the thickness of pipe as per ASME B31.3 and select the proper schedule. [15]

Data:

Allowable stress as per ASME B31.3,  $S = 16500$  psi

Joint Quality factor as per ASME B31.3,  $E = 1$

Coefficient,  $Y = 0.4$

$C = 0.15$  mm (Specified).

- b) Discuss in brief the application and techniques of cathodic protection for underground pipeline systems. [10]

**Q4) Write short notes on:** [25]

- a) Pipeline systems for Distillation Column.
- b) Statutory regulations and safety for Piping Engineering and design.
- c) Pipeline construction for cross country and offshore systems.

## SECTION - II

- Q5)** Discuss the importance and principles of piping networks analysis in Piping system. Derive an equation for flow of liquids through circular pipe that relates relationship between friction head loss and flow as well as branch parameters (such as equivalent length and diameter). State the assumptions made in this derivations. **[25]**
- Q6)** a) Discuss in brief piping fabrication, inspection and non-destructive testing methods used for piping systems. **[10]**
- b) Write a brief note on :HAZOP and HAZAN. **[10]**
- c) Discuss in brief the items to be included in P & I diagram. **[5]**
- Q7)** Write short notes on: **[25]**
- a) Piping elements and give its classification.
- b) Expansion Loops for Heat Exchangers.
- c) Costing for Piping Systems.
- Q8)** a) Discuss in brief the design considerations for pipeline systems for petroleum products. **[15]**
- b) Discuss various steps to be considered while developing plot plan and equipment layout for typical oil and gas industry. **[10]**





Total No. of Questions : 8]

SEAT No. :

**P4182**

**[4860]-425**

[Total No. of Pages : 2

**M.E. (Information Technology)**

**APPLIED ALGORITHMS**

**(2008 Course) (Semester - I)**

*Time :3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1) a)** What are various algorithm strategies? Explain Quick sort algorithm under DAC approach. What are various factors that decide the choice of the strategy? **[6]**
- b) What are Recurrences? Explain substitution, Iterative and master method with one sample example of each. **[10]**
- Q2) a)**
- i) Prove by Mathematical Induction  $1 + 2 + 3 + \dots + n = n(n+1)/2$ .
  - ii) Prove by counter example : Every integer less than 10 is bigger than 5.
  - iii) Prove by contradiction : If a number added to itself gives itself, then the number is 0. **[10]**
- b) What is asymptotic efficiency? What are asymptotic notations? Explain Big O,  $\Theta$ ,  $\Omega$  notations? **[8]**
- Q3) a)** Solve the following homogeneous and Non homogeneous Recurrences. **[8]**
- i) 
$$T(n) = \begin{cases} 0 & \text{if } n = 0 \\ 5 & \text{if } n = 1 \\ 3t_{n-1} - 4t_{n-2} & \text{otherwise} \end{cases}$$
  - ii)  $T(n) = t_n - 2t_{n-1} = 3^n$
- b) Explain Heap sort using divide and conquer approach. **[8]**

**P.T.O.**

- Q4)** a) Write a recursive solution to the All Pairs shortest path Floyd Warshall algorithm. Discuss the Time complexity. [8]
- b) Write Graham's scan algorithm for solving convex hull problem? What is the running time of this algorithm? [8]

### SECTION - II

- Q5)** a) How do you convert a linear program into Slack and standard form. Explain with the help of Simplex algorithm. [10]
- Minimize  $2X_1 + 7X_2$   
 Subject to  $3X_1 + X_2 \geq 24$ ,  $X_2 \geq 0$ ;  $X_3 \leq 0$ .
- b) Write and explain Kruskal's algorithm. [6]
- Q6)** a) What are the characteristics of approximation Algorithm? How approximation algorithms can be used to solve NP - Hard problems? Write an Approximation algorithm for Travelling Salesperson Problem. [10]
- b) What is randomized algorithm? Explain two categories with examples. [8]
- Q7)** a) What are properties of red-black tree? Explain insert operation with example. [8]
- b) Discuss various parallel computational models and explain how do they achieve parallelism in algorithm design? [8]
- Q8)** a) Discuss randomized Quick sort algorithm and also provide the analysis of time complexity. [8]
- b) Write short note on following: [8]
- i) CRCW nad EREW
  - ii) Parallel and Online Algorithm.



Total No. of Questions : 8]

SEAT No. :

**P4183**

**[4860]-426**

[Total No. of Pages : 2

**M.E. (Information Technology)**  
**SOFTWARE ENGINEERING METHODOLOGIES**  
**(2008 Course) (Semester - I) (514402)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume Suitable data if necessary.*

**SECTION - I**

**Q1)** Define the following terms with examples: **[18]**

- a) Extreme Programming.
- b) Waterfall model.
- c) Spiral Model.

**Q2)** a) Draw activity diagram, class scenarios and sequence diagram for Hostel management system. **[8]**

b) Differentiate between functional and nonfunctional requirements? What are the steps required to identify the functional requirements? **[8]**

**Q3)** a) How will you capture the dynamic behavior of the system? Why it is important to capture the dynamic behavior? Explain. **[8]**

b) State and explain different steps involved in drilling and synchronization. **[8]**

**Q4)** a) What are the advantages and disadvantage of repository? **[8]**

b) Find the Function point value for hostel management project. What is your conclusion by observing the FP value? **[8]**

**P.T.O.**

## SECTION - II

**Q5)** Define the following terms with example: **[18]**

- a) Reuse through delegation.
- b) Concurrency and synchronization.
- c) Design Evaluation.

**Q6)** a) Why boundary and control is important in project development. Explain. **[8]**

b) Explain Ishikawa's tools for cause and effect. **[8]**

**Q7)** a) What is state based testing? Where and how it is used? **[8]**

b) What is estimation? How it is measured? **[8]**

**Q8)** a) Explain white and black box testing with advantages and disadvantages. **[8]**

b) What is the role of positive and negative testing in software testing. **[8]**



Total No. of Questions : 8]

SEAT No. :

**P4184**

**[4860]-427**

[Total No. of Pages : 2

**M.E. (Information Technology)**  
**ADVANCED OPERATING SYSTEMS**  
**(2008 Course) (Semester - I) (514403)**

*Time :3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) What is distributed operating system? Explain any transparency mechanism along with its types. **[10]**
- b) List the commonly used models for configuring distributed computing systems. Explain processor pool model with neat diagram. **[8]**
- Q2)** a) Explain how IPC is carried out in DSM. Explain the addressing used in message passing. **[8]**
- b) Define a stub. What are methods for generation of a stub? Explain how the use of stubs helps in making an RPC mechanism transparent. **[8]**
- Q3)** a) Explain the concept of DSM. With the help of neat diagram, Explain page based DSM. **[8]**
- b) What is the need for leader election in the distributed operating system? Explain the Ring election algorithm with example. **[8]**
- Q4)** a) What is clock synchronization? What is the difference between Logical and Physical clock synchronization? Explain Lamport's logical clocks. **[10]**
- b) What is process migration? Explain any one address space transfer mechanism that is suitable for a process migration. **[6]**

**P.T.O.**

## SECTION - II

- Q5)** a) Differentiate between load estimation and load transfer policies. Explain any one load transfer policy. [8]  
b) What do you mean by good global scheduling algorithm? Explain. [8]
- Q6)** a) Explain the features of a Coda distributed file system. [8]  
b) With respect to a distributed file system, explain [8]  
i) File sharing semantics.  
ii) Transparency.  
iii) File access model.
- Q7)** a) Explain centralized mutual exclusion algorithm in detail. [8]  
b) What is a deadlock? How is deadlock detected in distributed systems? Explain with an example. [8]
- Q8)** Write short notes on the following (any three) [18]  
a) RPC in Amoeba.  
b) Group communication.  
c) Distributed Computing Environment.  
d) Object-based DSM.  
e) Process migration.



Total No. of Questions : 8]

SEAT No. :

**P4185**

**[4860]-428**

[Total No. of Pages : 2

**M.E. (Information Technology)  
SOFTWARE ARCHITECTURE**

**(Theory - 2008 Course) (514404 A) (Elective - I) (Semester - I)**

*Time :3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer ANY THREE questions from each SECTION.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What is Software Architecture? Differentiate between Reference Architecture and Product Line Architecture. **[8]**
- b) Why Software Architecture is important? Explain design pattern and framework in brief. **[8]**
- Q2)** a) Explain ANY FOUR of the following rules with respect to sound architecture documentation: **[12]**
- i) Write documentation from the Reader's point of view.
  - ii) Use a Standard Organization.
  - iii) Record Rationale.
  - iv) Keep documentation current but not too current.
  - v) Review documentation for fitness of purpose.
- b) What are Architectural structures? Explain Module, Component-and-Connector structures. **[4]**
- Q3)** a) What are Archetypes? Explain in details Customer Relationship Management archetype pattern. **[6]**
- b) What is MDA? Why MDA? Explain following three models of MDA in brief. **[10]**
- i) CIM
  - ii) PIM
  - iii) PSM

**P.T.O.**

- Q4)** a) Explain following Design Patterns in details: [12]  
i) Singleton  
ii) Factory Method  
iii) Proxy  
b) What are advantages of an Iterator pattern? Show a class structure diagram and explain how Iterator pattern works with the help of suitable diagram. [6]

## SECTION - II

- Q5)** a) What is Design Pattern? Explain the benefits and liabilities provided by Master-Slave pattern. [10]  
b) Compare and Contrast : Adapter and Mediator pattern. [8]
- Q6)** a) What are fundamental problems that Concurrency System try to prevent? Explain Isolation and Immutability solution for Enterprise Applications. [8]  
b) Write in brief on ANY TWO: [8]  
i) Fault tolerance and Exception Handling.  
ii) Patterns for Distributed Computing.  
iii) LOOKUP as resource management pattern.
- Q7)** a) What is Layering? Explain the important benefits of Layering. [6]  
b) Explain Presentation, Domain and Data Source principal layers in Enterprise Application. [6]  
c) What is Remote Façade? How it works? [4]
- Q8)** Explain ANY FOUR of the following concept: [16]  
a) Distributed Objects.  
b) Message Oriented Middleware.  
c) Application Servers.  
d) Message Brokers.  
e) Business Process Orchestration.





Total No. of Questions : 10]

SEAT No. :

**P4186**

**[4860]-429**

[Total No. of Pages : 3

**M.E. (Information Technology )  
REAL TIME AND EMBEDDED SYSTEM  
(2008 Course) (Semester - I) (Elective - I(b))(514404)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three question from each section.*
- 2) *Answers to the two section should be written in separate books.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) What are the challenges in embedded system design? Describe does it really work? How do we work on the system? [8]
- b) Briefly describe the major levels of abstraction in embedded system design process. Discuss the architecture stage in detail. [8]
- Q2)** a) Explain the 3-stage pipeline operation of ARM single-cycle instruction.[8]
- b) Draw the block diagram of ARM busses. List the various modes of operations of ARM 7processor. [8]
- Q3)** a) Draw SHARC Core processor block diagram and explain SIMD engine (PE) composition and operation in brief. [8]
- b) Explain the branching and pipelining function in SHARC processor with suitable examples. [8]
- Q4)** a) Describe the register structure of ARM. Processor, draw CPSR and describe the associated control bits. [8]
- b) Discuss the advantages and disadvantages of top down and bottom - up design process in embedded system design. [8]

***P.T.O.***

**Q5)** Write short note on any three. **[18]**

- a) General characteristics of Embedded systems.
- b) Key features of SHARC Processor.
- c) Feature of I2C bus.
- d) Clock synchronization and handshake in I2C bus.

### **SECTION -II**

**Q6)** a) Discuss and show that clock driven scheduling performs better in deterministic system. **[8]**

- b) Give the classification of the scheduling algorithm, compare and contrast static vs. dynamic algorithm with examples. **[8]**

**Q7)** a) Briefly describe the difference between waterfall and spiral development module. **[8]**

- b) What are assumption for priority driven scheduling of periodic tasks. **[8]**

**Q8)** a) Discuss the data transfer format of I2C bus with respected to read and write cycle. **[8]**

- b) What is distributed network architecture in embedded system? Explain with suitable examples. **[8]**

**Q9)** a) Explain the following term in brief. **[8]**

- i) Valid Schedule.
- ii) Schedulable Set of Jobs.
- iii) Tardiness.
- iv) Lateness.

b) What are advantages and disadvantages of cyclic scheduler? [8]

**Q10)** Write short notes on any three. [18]

- a) A Periodic or Sporadic task.
- b) Standard Data frame of CAN bus.
- c) Myrinet bus.
- d) Weighted round robin approach.



Total No. of Questions : 6]

SEAT No. :

P3974

[Total No. of Pages : 3

[4860] - 43

**M.E. (Civil - Structures) (Semester - I)**

**PLASTIC METHOD FOR ANALYSIS AND DESIGN OF STEEL STRUCTURES**

**(Elective - II (c)) (2008 Pattern)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answers to the TWO sections should be written in separate answer books.*
- 3) *Neat sketches must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of non-programmable calculator, IS : 800 - 2007 and steel table is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain complete, over complete and partial collapse of structure. [5]  
b) Determine shape function of I-section having following dimensions. [12]  
Top flange = 250 x 50 mm  
Bottom flange = 350 x 50 mm  
Web = 40 x 400 mm (overall depth)  
c) A simply supported beam of span ' $l$ ' is subjected to central load ' $W$ '. In progressive loading when  $W$  reaches to  $W_p$  - plastic collapse occurs. Draw a neat sketch showing zone of plasticity in the beam. State the equation for depth of yielding ' $e$ ' at any section in zone of plasticity. [8]
- Q2)** a) A Rectangular Portal frame PQRS is fixed at P & S. Columns PQ & RS are 5m in height & beam QR is 6m long.  $M_p$  for beam is thrice that for columns. It is subjected to factored udl of 40 kN/m over QR & horizontal factored concentrated load of 80 kN at Q in the direction QR. Sketch all possible mechanisms & obtain design moment  $M_p$ . Also draw statically admissible bending moment diagram. [13]

**P.T.O.**

b) A continuous beam ABCD is simply supported at A, B, C & D. Spans AB = 4m, BC = 6m & CD = 4m.  $M_p$  is uniform. It is subjected to factored loads as under. [12]

i) Total udl value on AB & CD = W.

ii) Concentrated load  $2W$  at center of BC.

Find collapse load 'W' & draw statically admissible bending moment diagram. What is the type of collapse?

**Q3)** A symmetrical gable portal frame ABCDE has bases A & E fixed 12 m apart. Vertical columns AB & ED each equal to 4 m & apex C is 8 m above base. It is subjected to horizontal load 25 kN at B & concentrated load of 60 kN each at centre of each gable beam.  $M_p$  is uniform. [25]

a) Draw all basic mechanisms and obtain  $M_p$  in each case.

b) Draw (sway + Gable) mechanism & obtain  $M_p$ .

c) Draw free body diagram of beam & column.

## SECTION - II

**Q4)** a) Classify symmetrical 'I' section having width of flange 300 mm & overall depth 400 mm. Thickness of section is 30 mm uniform.  $F_y = 280$  MPa. If this section is used as a beam, find moment of resistance as per IS : 800-2007 codal provisions. [12]

b) A simply supported beam has a span 5 m. If section used is ISLB 350. Find moment of resistance of the section in following two cases.

i) Compression flange is laterally supported fully.

ii) Compression flange is laterally restrained at both the ends and at Mid span only. Use  $F_y = 250$  MPa. [13]

**Q5)** A column in a building is subjected to factored axial compressive load of 300 kN & factored bending moments of 55 kN.m & 40 kN.m at its top hinged end & bottom fixed end respectively. Both bending moments produce identical curvature about zz axis. Height of column is 4.5m & it is braced at its mid height to provide local lateral restraint for buckling about yy axis . The column belongs to non-sway frame. Design the section & use specifications for interaction between moment & axial compression as per IS : 800 - 2007.

**[25]**

**Q6)** In a rectangular portal frame, a corner connection is to be designed. Bending moment at knee is 180 kN.m. If designed section for beam & column both is ISMB 400. Design & Draw details at knee portion  $F_y = 250$  MPa. Apply all checks & provide diagonal stiffener if required any.

**[25]**





Total No. of Questions : 12]

SEAT No. :

**P4187**

**[4860]-430**

[Total No. of Pages : 3

**M.E. (Information Technology)**

**BIOINFORMATICS**

**(Elective - I) (514422 C) (2008 Pattern) (Semester - I)**

*Time :3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer Question 1 or 2, 3 or 4, 5 or 6 from Section - I and question 7 or 8, 9 or 10, 11 or 12 from Section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) Define Bioinformatics and its scope. Why is it a multidisciplinary field? [8]
- b) Enlist the major databases in Bioinformatics. Which databases play a major role in protein structure prediction in Bioinformatics. [8]

OR

- Q2)** a) Explain the various tools for web search in Bioinformatics. [8]
- b) State the various data mining techniques in Bioinformatics. Explain any four. [8]
- Q3)** a) List different algorithms in Bioinformatics. What is the significance of Genome rearrangement in the field of Bioinformatics? [8]
- b) Explain the terms Intons and Exons and their significance. [8]

OR

- Q4)** a) What is the central dogma of molecular biology? Explain the concept of DNA replication in bioinformatics. [8]
- b) Discuss protein purification and characterization in detail. [8]

**P.T.O.**



- Q5)** a) Explain Hidden Markov model for Sequence Alignment. What is Gene Mapping? [10]
- b) Explain significance of FASTA matches and steps followed in a FASTA search. [8]

OR

- Q6)** a) Write short notes on: [10]
- BLAST
  - Pairwise Sequence Alignment (PSA)
- b) What are the types of machine learning processes? Explain any two machine learning processes. [8]

### **SECTION - II**

- Q7)** a) What are the various types of structure prediction methods for genes. Explain Gene expression in detail and its need. [10]
- b) What is meant by iterative method of multiple sequence alignment. Give an algorithm which does this type of alignment and give a tool which performs it. [8]

OR

- Q8)** a) List the various gene structures prediction methods. Explain any two in detail with appropriate examples. [10]
- b) What are microarrays? Explain the spotting process in microarrays for data analysis? [8]

- Q9)** a) Explain Genomics and Proteomics with their similarities and differences. [8]
- b) Explain the need of structure visualization in Bioinformatics. Discuss any one technique for structure visualization in detail. [8]

OR

- Q10)** a) Explain the need of protein Folding in Bioinformatics. Which databases in Bioinformatics support protein folding visualization? [8]
- b) Discuss Protein Structure classification in brief. [8]

- Q11)** a) Discuss how drug discovery is helpful in bioinformatics with neat diagram. [8]
- b) Discuss cell cycle in detail for Bioinformatics. [8]

OR

- Q12)** a) What is drug receptor? Explain the role of drug receptors in Drug Discovery. [8]
- b) How does drug discovery help in targeting drugs for disease diagnosis?[8]



Total No. of Questions : 8]

SEAT No. :

**P4188**

[Total No. of Pages : 2

[4860]-431

M.E. (I.T.)

**a - INFORMATION ASSURANCE & SECURITY**

**(2008 Pattern) (Semester - I) (Elective - II)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) Illustrate the hacking steps. [9]  
b) Explain importance of digest algorithms. [9]
- Q2)** a) Write email access policy in a typical organization. [8]  
b) What are the disadvantages of firewalls? [8]
- Q3)** a) Explain different protocols in SSL suite. [8]  
b) How can you use browser for safe browsing. [8]
- Q4)** a) What are the advantages of Public key systems over symmetric key systems? [8]  
b) Explain how attack takes place in physical layer. [8]

***P.T.O.***

## SECTION - II

- Q5)** a) Explain any one tool used for attacking remote systems. [9]  
b) Explain Network layer security attacks. [9]
- Q6)** a) Explain DES block diagram. [8]  
b) Illustrate the use of digital certificates. [8]
- Q7)** a) Explain server side security settings. [8]  
b) Explain measures of security in wireless networks. [8]
- Q8)** a) Explain host based IDS systems. [8]  
b) Explain Identity management using Aadhaar card in India. [8]



Total No. of Questions : 10]

SEAT No. :

**P4189**

[Total No. of Pages : 2

**[4860]-433**

**M.E. (Information Technology)**

**C : GEOGRAPHICAL INFORMATION SYSTEMS (Elective - II)**

**(2008 Course) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Solve any three questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) Define GIS. List and explain five the main components of GIS. [8]  
b) What is Map Projection? Explain commonly used map projections. [8]
- Q2)** a) Explain GIS architecture with suitable diagram. Identify the fundamental GIS operations. [8]  
b) Explain how data modeling and spatial analysis is performed in GIS?[8]
- Q3)** a) Explain the concept of Querying the Spatial Data. Write short notes on importing and exporting the spatial data. [8]  
b) What are the common errors in GIS database? Explain with suitable examples how these errors can be corrected? [8]
- Q4)** a) Differentiate between active and passive remote sensing. [8]  
b) describe Electromagnetic spectrum and types of platforms in remote sensing. [8]

***P.T.O.***

- Q5)** a) Discuss the basics of remote sensing. What is an ideal remote sensing system? [9]  
b) Explain the interaction of EMR with earth's surface feature and atmosphere. [9]

### **SECTION - II**

- Q6)** a) Explain [8]  
i) visual image interpretation.  
ii) Digital image processing techniques.  
b) What is interpretation? Explain the various methods for interpretation. [8]
- Q7)** a) The affine transformation allows rotation, translation, skew and differential scaling. Describe each of these image transformations. [8]  
b) List and explain four types of data or levels of measurement. Give suitable examples. [8]
- Q8)** a) What is a grid system? Explain UTM grid. [8]  
b) What is Geocoding and explain any one application of Geocoding. [8]
- Q9)** a) What is Interpolation? Explain various data sources for Interpolations. [8]  
b) Explain the four key activities that any urban planner or scientist use geographic information. [8]
- Q10)** Write a short note on any three of the following. [18]  
a) Dynamic Segmentation.  
b) Image Interpretation Equipments.  
c) Image Registration.  
d) Factors affecting Reliability of Spatial Data.



Total No. of Questions : 12]

SEAT No. :

**P4190**

**[4860] - 434**

[Total No. of Pages : 2

**M.E. (Information Technology)  
NET CENTRIC COMPUTING  
(2008 Course) (514426) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Use of Calculator is allowed.*
- 4) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1) a)** Explain network architecture with the help of neat diagram. **[8]**  
b) State and explain the way of evolution of today's network. **[8]**

OR

- Q2) a)** State the process of packet transmission in virtual circuit network. **[8]**  
b) Explain principle of communication network. **[8]**

- Q3) a)** State and explain various delays in ATM networks. **[10]**  
b) Explain in brief wave-division multiplexers system. **[8]**

OR

- Q4) a)** Explain with suitable diagram architecture of wireless networks. **[8]**  
b) Explain the header structure with suitable diagram of ATM header. **[10]**

- Q5) a)** Explain way of control decisions in circuit switched, datagram, and virtual circuit network. **[8]**  
b) What is utilization of server according to queuing theory? **[8]**

OR

**P.T.O.**

- Q6)** a) What are the parameters specified in the Quality of Service? [8]  
b) Explain algorithm to carry out dynamic routing optimization? [8]

**SECTION - II**

- Q7)** a) What is KEEPALIVE message in BGP? State its importance. [8]  
b) Explain two-crossing problem in mobile IP routing. [8]

OR

- Q8)** a) How label swapping is done in IP switching? [8]  
b) What is NAT? Describe in detail concept of NAT. [8]

- Q9)** a) Explain mobile IP addressing and formats. [8]  
b) State and explain various features of IPv6. [8]

OR

- Q10)** a) What is auto-configuration? Explain renumbering in IPv6. [8]  
b) Explain a protocol suit H.323 for IP telephony. [8]

- Q11)** a) Explain phases of DSDV protocol used in MANET. [9]  
b) What is working principle of DSR protocol for ad-hoc networks? [9]

OR

- Q12)** Write short notes on: [18]  
a) Link - clustered network architecture.  
b) Ad-hoc networks challenges.  
c) Taxonomy of routing protocols.





Total No. of Questions : 8]

SEAT No. :

**P4191**

**[4860]-435**

[Total No. of Pages : 2

**M.E. ( Information Technology )**  
**ADVANCED TRENDS IN DATABASE SYSTEMS**  
**(2008 Pattern) (Semester-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat figures must be drawn wherever necessary.*
- 4) *Make suitable assumptions whenever necessary.*
- 5) *Figures to the right indicate full marks.*

**SECTION-I**

- Q1)** a) What is distributed databases? Explain concept of schema implementation Issues under the distributed databases. **[8]**
- b) Discuss the transparency issues in distributed database. **[8]**
- Q2)** a) Discuss in brief about architecture of data warehouse. **[8]**
- b) Describe dimensionality reduction techniques in data warehouse. **[8]**
- Q3)** a) Define Classification and Prediction. Explain decision tree based classification method with suitable example. **[8]**
- b) Give suitable example and explain appropri algorithm in detail. **[8]**
- Q4)** Write short note on: **[18]**
- a) Semi structured data and XML.
  - b) Multi - level Association Rules.
  - c) Data integration and preprocessing.
  - d) Data cubes.

***P.T.O.***

## SECTION-II

- Q5)** a) Discuss active DB w.r.t passive database along with implementation issues in active database. [8]
- b) Explain semantics of Event - Condition - Action rules with example. [8]
- Q6)** a) With suitable diagram, explain TP system architecture and functions of TP monitor. [8]
- b) Explain the following terms: [8]
- i) Object query language
  - ii) Correlation.
  - iii) Inheritance
  - iv) Persistence with reference to object databases.
- Q7)** a) Explain web crawling along with its characteristics and crawling policies. [8]
- b) Explain information retrieval in detail. [8]
- Q8)** Write short note on ( Any 3) [18]
- a) OR mapping in object database.
  - b) GoogleBoat -A web spider.
  - c) Unsupervised learning.
  - d) Web mining.



Total No. of Questions : 10]

SEAT No. :

**P4192**

**[4860]-436**

[Total No. of Pages : 3

**M.E. ( Information Technology)**

**MANAGEMENT TRENDS IN INFORMATION TECHNOLOGY**

**(2008 Course) (Semester-II) (514427)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any THREE questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) Explain the applications of IT in Insurance sector. Give suitable examples to justify your answer. **[8]**
- b) Consider the following business situations, briefly describe and justify the most suitable Information system and Information Technology that could be implemented and suggested.
- “The management of a engineering college wants to report percentage attendances in classes for students on a weekly basis as well as analysing some of the student data on an ad-hoc basis according to current information requirements”. **[8]**
- Q2)** a) What is project plan ? Explain five distinct aspects which the Project Manager should consider when preparing a project communication plan. **[8]**
- b) How do you go about deciding the applications of computers in a business organization? Give examples of IT applications in the industries like railways and insurance. **[8]**
- Q3)** a) Define a milestone in the software development . How it is represented in the WBS? **[8]**
- b) Explain how companies are aligning IT strategy with business strategy? Give suitable examples. **[8]**

***P.T.O.***

- Q4)** a) What is the need of IT auditing while developing information systems? Explain. [8]
- b) Explain how Project Team is organized ? Also explain how to manage team issues? [8]

**Q5)** Explain any THREE of the following: [18]

- a) Project Constraints.
- b) Project Changes.
- c) Network Diagram of project.
- d) Disaster Recovery Strategy.
- e) Establishing Project Priorities.

### **SECTION-II**

- Q6)** a) What steps are involved in PERT analysis? [8]
- b) The director of information systems of a major engineering firm is pondering whether to break apart and totally reconfigure his computer operations centre. At present, a single large computer supports the company's batch and online systems. Workloads are quite erratic and in the past year long response time delays on the online systems, combined with batch schedules, have put him under considerable pressure to provide more responsive service. [8]

Questions:

- i) Suggest several alternative hardware configurations and evaluate them in terms of both overall efficiency and responsiveness to user needs.
- ii) What other actions might be taken to improve responsiveness to user needs without reconfiguring the hardware?

- Q7)** a) What are common computer abuses that damage IT infrastructure ? [8]
- b) Explain the major parts in building the software quality assurance ( SQA) plan and its role in product development life cycle. [8]

**Q8)** a) Explain the concept of Knowledge Management and Change Management. [8]

b) What are different software quality standard? Explain in detail SEI-CMM and its significance with the software industry. [8]

**Q9)** a) Explain the importance of ethics in IT business? Also explain approaches to making ethical judgments. [8]

b) Explain the concept of domain name with reference to cyber law. [8]

**Q10)** Write Short note on any THREE of the following: [18]

- a) Team Models.
- b) Scope of the IT Act.
- c) Encryption techniques.
- d) Change Control.
- e) The Consumer Protection Act.



Total No. of Questions : 8]

SEAT No. :

**P4193**

**[4860]-437**

[Total No. of Pages :2

**M.E. ( Information Technology)**  
**a -INTERNET AND WEB TECHNOLOGIES**  
**(2008 Course) (Elective - III) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer 3 questions from Section -I and 3 questions from Section -II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) Explain JSR 168 portlet. [8]  
b) Explain SOAP protocol. [8]
- Q2)** a) Explain Web Browser Security features. [8]  
b) Explain MVC Design Pettern. [8]
- Q3)** a) Explain any three Java Patterns. [8]  
b) Compare Perl and PHP. [8]
- Q4)** a) Explain the role of different scripting languages in Web development. [9]  
b) What is DNS ? How a DNS is registered on the Internet? [9]

**SECTION-II**

- Q5)** a) Explain the JSTL core tags with example. [8]  
b) Explain the structure of Java Mail API and list the advantages of it. [8]
- Q6)** Write short notes on: [16]  
a) Java Applets.  
b) JNDI.  
c) RSS feeds.

***P.T.O.***

- Q7)** a) What do you mean by Web services, explain with appropriate examples? [8]
- b) Write the role of a Web Crawler in Web Data Mining. [8]
- Q8)** a) Explain with basic components in a diagram, how a Search Engine works. [9]
- b) What do you mean by Active Search Engine and Passive Search Engine? [9]



Total No. of Questions : 8]

SEAT No. :

**P4194**

**[4860]-438**

[Total No. of Pages : 2

**M.E. ( Information Technology)**

**ADVANCED TOPICS IN OPERATING SYSTEMS**

**(514411) (2008 Pattern) (Elective-III(b)( Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Figures to the right hand indicates full marks.*
- 3) Answer to the two sections should be written in separate answer books.*
- 4) Neat diagrams must be drawn wherever necessary.*

**SECTION-I**

**Q1) a) Explain the Windows OS architecture in detail. [10]**

b) Differentiate Linux OS architecture with Solaris OS architecture in detail. [8]

**Q2) How does Create Process function work? [16]**

**Q3) Explain the following with respect to Linux. [16]**

- a) Fork mechanism.
- b) Clone mechanism.
- c) Light weight processes.
- d) Copy - on - write ( COW) in Linux.

**Q4) a) How is memory managed in Windows O.S? [8]**

b) Explain the buddy memory management algorithm in Linux OS. [8]

**SECTION-II**

**Q5) a) Enlist the different file system formats available in Windows OS? Explain any one in detail. [8]**

b) What are features that make NTFS better than FAT32. [8]

***P.T.O.***



- Q6)** a) What are the different files systems supported by Linux ? How is it possible to configure these many file systems Linux? [8]
- b) Explain with respect to Linux file system the following. [4]
- i) Super block. [4]
- ii) Inode block.
- Q7)** a) Explain block device architecture in Linux. [8]
- b) Explain I/O system components in Windows OS. [8]
- Q8)** Write Short notes on the following ( Any three) [18]
- a) Windows device drivers.
- b) Request structure in Linux.
- c) The bio structure in Linux.
- d) Setting up TCP/IP in Windows.
- e) Linux OS networking.



Total No. of Questions : 10]

SEAT No. :

**P4672**

[Total No. of Pages : 2

**[4860]-439**

**M.E. (Information Technology)**  
**MOBILE COMPUTING AND M COMMERCE**  
**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Question no 5 and Question no 10 are compulsory.*
- 3) Answer three questions from each section.*
- 4) Neat diagrams must be drawn wherever necessary.*
- 5) Figures to the right indicate full marks.*
- 6) Use of calculator is allowed.*
- 7) Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain in detail with neat diagram GPRS architecture. [8]  
b) Explain in detail with neat diagram SMS architecture and advantages of SMS. [8]
- Q2)** a) Explain in detail features & frequency allocation technique for GSM.[8]  
b) What is handoff mechanism? Explain in detail Soft, Softer, Hard handoff with neat diagram. [8]
- Q3)** a) Explain with neat diagram WAP protocol stack. [8]  
b) Explain in detail Spread Spectrum Technology. [8]
- Q4)** a) Explain in detail different security techniques in mobile computing. [8]  
b) Compare 3G & 4G technology of Mobile communication. [8]

**P.T.O.**

- Q5)** Write a short note on (any two): **[18]**
- a) CDMA
  - b) Bluetooth Technology
  - c) WLAN

**SECTION - II**

- Q6)** a) Explain the concept of public key cryptography. Discuss the security protocol in wireless network in which these techniques are used. **[8]**
- b) Explain the security framework for mobile computing. How do we ensure security in a mobile environment through Mobile VPN? **[8]**
- Q7)** a) Explain M-commerce life cycle. **[8]**
- b) What are the emerging issues in mobile commerce? **[8]**
- Q8)** a) Describe emerging applications of M-commerce. **[8]**
- b) Explain the entities in M-commerce life cycle. **[8]**
- Q9)** a) Explain in detail Ad-hoc network. **[8]**
- b) Explain in detail MMS service Architecture. **[8]**
- Q10)** Write a short note on (any two): **[18]**
- a) Mobile IP
  - b) EDGE
  - c) Wi Max



Total No. of Questions : 6]

SEAT No. :

**P4462**

**[4860]-44**

[Total No. of Pages : 2

**M.E. (Civil-Structures)**

**d-DESIGN OF INDUSTRIAL STEEL STRUCTURES**

**(2008 Course) (Semester-I) (501405) (Elective-II)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Attempt any two questions from Section-I and II.*
- 2) *Answers to the two Sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams should be drawn wherever necessary.*
- 5) *If necessary, assume suitable data.*
- 6) *Use of electronic pocket calculator, relevant IS code and steel table are allowed.*

**SECTION-I**

- Q1)** a) Explain in brief analysis and design of knee braced trussed bent with hinged. **[9]**
- b) Explain in brief design of knee brace as per the codal provision and its limitation. **[9]**
- c) Differentiate fixed and partially fixed bases in details with suitable sketches. **[7]**
- Q2)** Analysis the columns of industrial building for different end condition at base i.e. hinged, fixed and partially fixed. Draw bending moment diagram of the columns. **[25]**
- Q3)** a) State and explain analysis and design of gable portal frame with gantry loads. **[15]**
- b) State and explain design of bracket supporting gantry loads. **[10]**

**P.T.O.**

## SECTION-II

- Q4)** a) Explain in brief design concept of open web frames for industrial shed. **[15]**
- b) Explain in details merits and demerits of trussed purlins. **[10]**
- 
- Q5)** a) Explain the use of mobile gantry girder and its design concept as per codal provision. **[15]**
- b) Explain design criterion of machine foundation for and industrial building. **[10]**
- 
- Q6)** a) State and explain analysis and design of various bracing systems in industrial shed structure. **[15]**
- b) Explain in brief different type of industrial flooring with design concept. **[10]**



Total No. of Questions : 6]

SEAT No. :

**P4195**

**[4860]-440**

[Total No. of Pages : 2

**M.E. ( Information Technology)  
d : USER INTERFACE DESIGN  
(2008 Course) (Elective-III)( Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate answer sheet.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data , if necessary.*

**SECTION-I**

- Q1) a)** If you were the HCI researcher on a speech interaction project intended to replace the WIMP interface, then which of the techniques would be most relevant to your work? Why? Suggest two design improvements. **[8]**
- b) Discuss general principles and goals of User Interface Design. **[8]**
- Q2) a)** Describe how HCI affects use of Hospital Management system with respect to: **[8]**
- i) The aim of the program ( what it is used for)
  - ii) Describe its interface (picture of the screen)
  - iii) Describe its interaction ( how it is used)
- b) Express your opinion - “ A design should be User - Centric”. **[8]**
- Q3) a)** Justify your answer : **[8]**
- i) Usability only increases development costs and lengthens development time.
  - ii) The user interface is really just adding good graphics to make the application appealing.
  - iii) Usability is user interface design.
- b) As screens grow larger , some designers are tempted to increase the number of menu items displayed at once. Give three strategies for organizing the layout and justify them briefly based on user tasks and knowledge. **[10]**

**P.T.O.**

## SECTION-II

- Q4)** a) What influence does the social environment in which you work have on your interaction with the computer? What effect does the organization (Commercial or academic) to which you belong have on the interaction? Discuss. [8]
- b) Consistency could be considered a major category of interactive principles, on the same level as learnability, flexibility and robustness. If this had been the case, which principles would appear in support of consistency? [8]
- Q5)** a) Explain the guidelines for data display and data entry? [8]
- b) You have to design an interface for Vending Machine, which serves tea or coffee. Considering various user communities , their requirements and tastes, apply object action interface modeling technique to design this interface. Sketch the task and interface models. [8]
- Q6)** a) Describe the user interface development process, starting at the earliest stages and continuing up to the point when the interface is complete. Name the steps in this process and briefly describe what happens. Briefly discuss the importance of each step, what specific things we must pay the most attention to, and how information relevant to the step is gathered, analyzed , or used . If steps are repeated describe: why, what changes, and when you stop. [10]
- b) Evaluate Microsoft Word interface using the “Eight golden rules of interface design”. [8]



Total No. of Questions : 8]

SEAT No. :

**P4196**

**[4860]-445**

[Total No. of Pages : 2

**M.E. ( Information Technology)**  
**SERVICE ORIENTED ARCHITECTURE**  
**( Theory) ( Revised 2008 Pattern) ( Elective-IV) ( Semester- II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from Each Section.*
- 2) *Question 1 and 5 are compulsory.*

**SECTION-I**

- Q1)** a) Consider Online car rental service center and model it with SOA. [12]  
b) Explain SOA architecture in detail. List and explain Stakeholders involved in SOA life cycle. [6]
- Q2)** a) Explain Role of EJB in SOA governance. [8]  
b) Explain SOAP, WSDL in detail with example. [8]
- Q3)** a) Explain difference between Consumer Centric SOA and User Centric SOA. [8]  
b) Explain enterprise solution assets in detail with one example. [8]
- Q4)** a) Write short note on IBM on demand operating environment? [8]  
b) Message Exchange Patterns for Enterprise SOA in real time systems.[8]

**SECTION-II**

- Q5)** a) Consider online airline reservation system, assume suitable constraints and model it with SOA Architecture. [12]  
b) Explain SOA security issues and how to address them in detail. [6]

***P.T.O.***



- Q6)** a) Explain impact of changes to services in the SOA lifecycle? [8]  
b) Explain role of SOA architect in industry. [8]
- Q7)** a) How the implementation of integration pattern will work in SOA. [8]  
b) Explain Business Centric SOA in detail. [8]
- Q8)** a) What are the different standards used to implement SOA? [8]  
b) Illustrate SOA service registry. [8]



Total No. of Questions : 6]

SEAT No. :

**P4197**

**[4860]-446**

[Total No. of Pages : 1

**M.E. ( Instrumentation & Control )  
TRANSDUCER DESIGN  
( 5061101 ) ( 2008 Course ) ( Semester - I )**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Solve any two questions from each section.*
- 2) Write Section -I and Section - II on separate answer sheet.*
- 3) Neat diagrams must be drawn whenever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam table is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** Design a weight indicator using strain gauge type load cell . Draw neat sketch of block diagram and also explain importance of each block in detail. [25]
- Q2)** With neat diagram explain Magnetic flowmeter. List its advantages and disadvantages. Also mention different methods of its excitation. [25]
- Q3)** Draw a block diagram of LVDT signal conditioning and explain each circuit in detail. [25]

**SECTION-II**

- Q4)** Discuss LASER transducer and explain its applications for welding , surface hardening and printing in detail. [25]
- Q5)** Design resistive type transducer for liquid level measurement in which it gives output in the form of voltage for input level. [25]
- Q6)** List various gas sensors and explain their industrial applications in detail. [25]



Total No. of Questions : 8]

SEAT No. :

**P4198**

**[4860]-447**

[Total No. of Pages : 2

**M.E. ( Instrumentation & Control)(Process & Biomedical)  
MATHEMATICAL METHODS IN INSTRUMENTATION  
( 5061102) (2008 Course)( Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any 3 questions from each section.*
- 2) *Use separate answer book for each section.*
- 3) *Assume suitable data if necessary.*
- 4) *Use of calculators, log tables, charts is allowed.*
- 5) *Figures to the right indicate full marks.*

**SECTION-I**

**Q1)** Calculate the Singular Value Decomposition of the matrix **[18]**

$$\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$

**Q2)** Explain the process of finding the orthonormal vectors from any vectors with suitable example. **[16]**

**Q3)** With  $h = 0.1$  , find the numerical solution on  $0 \leq x \leq 1$  by Runge- Kutta method for  $y' = y^2 + 2x - x^4$  with  $y(0) = 0$  and compare your result with exact solution  $y = x^2$  **[16]**

**Q4)** Explain projection theorem with suitable example. **[16]**

**SECTION-II**

**Q5)** Explain Binomial probability distribution with suitable example. **[16]**

**Q6)** The probability of defective bolt is 0.1. Find  
a) The mean,  
b) The standard deviation,  
for the no. of defective bolts in a total of 400 bolts. **[16]**

*P.T.O.*

**Q7)** In certain PLC manufacturing plant , 3 divisions D1, D2 and D3 make 30%, 45% and 25% respectively , of the total PLCs. It is known from past experience that 2%, 3% and 2% of the total PLCs made by each division, respectively, are defective. Now suppose that random PLC is selected from total PLCs. **[18]**

- a) What is the probability that it is defective?
- b) If selective PLC is defective, what is the probability that it is made by division D3? Use Bayes's rule.

**Q8)** Define: **[16]**

- a) Moment.
- b) Moment generating function.
- c) Skewness.
- d) Kurtosis.



Total No. of Questions : 6]

SEAT No. :

**P4199**

**[4860]-448**

[Total No. of Pages : 2

**M.E. ( Instrumentation & Control)**  
**COMMUNICATION PROTOCOLS FOR INSTRUMENTATION**  
**( 5061103) (2008 Course) (Semester-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Solve any two questions from each section.*
- 2) Figures to the right side indicate full marks.*

**SECTION-I**

**Q1)** Attempt following :

- a) Explain information flow requirements in process automation. [10]
- b) With neat diagram explain RS-232 in detail. [10]
- c) Explain simplex and duplex communication systems. [5]

**Q2)** Attempt following :

- a) Explain criteria for network selections in process control. [10]
- b) Explain Modbus and Modbus Plus communication protocol. [10]
- c) Give advantages and Limitations of open networks. [5]

**Q3)** Attempt following :

- a) List and explain different levels in the factory communications network. [10]
- b) Discuss different types of field bus network connection topology. [10]
- c) Give and explain terminology used in field bus. [5]

**P.T.O.**

## SECTION-II

**Q4)** Attempt following :

- a) Explain architecture of foundation field bus with neat sketch. [10]
- b) Explain installation details of field bus in a hazardous area with example. [10]
- c) Write short note on Z-wave. [5]

**Q5)** Attempt following :

- a) Explain working principle of HART protocol in detail. [10]
- b) Explain ZigBee wireless protocol with any application. [10]
- c) List different wireless protocols and discuss its advantages over other existing protocols. [5]

**Q6)** Attempt following :

- a) Explain any application of Bluetooth devices in detail. [10]
- b) Explain Wi- Fi protocol in detail. [10]
- c) Write note on the standards used in communication systems. [5]



Total No. of Questions : 12]

SEAT No. :

**P4200**

**[4860]-449**

[Total No. of Pages : 2

**M.E. ( Instrumentation & Control) (Process & Biomedical)**

**ANALYTICAL INSTRUMENTATION**

**( 5061104) (2008 Course) (Semester-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from section I and three questions from section II.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam table is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1) a)** Explain following term give two examples of each **[8]**
- i) Quantitative analysis.
  - ii) Qualitative analysis.
- b) Explain the experimental setup of Conductometry with neat sketch. **[8]**

OR

- Q2) a)** List Different Radiometric and Photometric unit of chemical analysis. **[8]**
- b) Difference between classical and instrumental method for chemical analysis on the basis of merit and demerit. **[8]**

- Q3) a)** What is Spectrophotometer? Explain Direct Reading Spectrophotometer with neat sketch . **[8]**
- b) Which are the laws of photometry, derive mathematical expression to combine all the laws & deviation from it. **[10]**

OR

- Q4) a)** Explain Atomic Absorption Spectroscopy with neat sketch. **[10]**
- b) Explain Ultrasonic Nebuliser with neat sketch. **[8]**

***P.T.O.***

- Q5) a)** Explain Integral burner atomiser with neat sketch. [8]  
b) Explain flame photometer with neat sketch. [8]

OR

- Q6) a)** Explain Time of Flight type Mass Spectrometer with neat sketch. [8]  
b) Write a short notes on : [8]  
i) Quadrupole Mass Spectrometer.  
ii) Phosporiometer.

**SECTION- II**

- Q7) a)** Explain with neat sketch Ratio Recording flouriometer. [8]  
b) Explain with neat sketch Spectroflouriometer. [8]

OR

- Q8) a)** Explain Gas Chromatography with neat sketch. [8]  
b) Explain flame ionisation Type of detector used in Gas Chromatography with neat sketch. [8]

- Q9) a)** Explain HPLC with neat sketch. [10]  
b) Explain Dual Lead Reciprocating Pump used in HPLC with neat sketch. [8]

OR

- Q10) a)** Explain proportional counter with neat sketch. [10]  
b) Explain X-Ray Instrumentation with Neat sketch. [8]

- Q11) a)** Explain with neat sketch GM Counter. [8]  
b) Explain NMR with neat sketch. [8]

OR

- Q12) a)** Explain with neat sketch CO Analyser. [8]  
b) What is ESCA ? Explain in brief Auger emission spectroscopy. [8]





Total No. of Questions : 6]

SEAT No. :

P3975

[Total No. of Pages : 2

[4860] - 45

M.E. (Civil/Structures)

THEORY OF PLATES AND SHELLS

(2008 Pattern) (Semester - II)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt any two questions from each section.
- 2) Answer to the two sections should be written in separate books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of non programmable electronic calculator is allowed.
- 6) Assume suitable data, if necessary.

**SECTION - I**

- Q1)** a) Explain the basic difference between plates and beams with respect to geometry and behaviour. [5]
- b) Differentiate between thin and thick plates. [5]
- c) A plate with domain 'R' is bent into a surface which has constant curvature  $1/r_x$ ,  $1/r_y$ ,  $1/r_{xy}$  respectively for all values of x and y in 'R'. Find the deflection surface 'w' of this plate. Include the rigid body displacements of the plate. [15]
- Q2)** a) Derive Navier's solution for deflection a simply supported rectangular plate under uniform intensity of loading q. [16]
- b) Using energy approach, obtain the expression for deflected shape of simply supported isotropic plate subjected to uniform intensity of loading q. [9]
- Q3)** A uniformly loaded circular plate with radius 'a' has its edge simply supported. Starting from basics principles, obtain the expression for maximum deflection. [25]

P.T.O.

## SECTION - II

- Q4)** a) An RCC hemispherical dome of radius 6 m and thickness 120 mm is supported on its lower edge by roller support all along the periphery. Determine the membrane forces in the dome considering self weight only. Plot the variation of internal forces along the meridian. [18]
- b) What do you understand by Principal curvature at a point on the surface of the shell? Explain the term Gaussian curvature. [7]
- Q5)** a) Derive the equations of equilibrium for a small element of a cylindrical shell. Show the stress resultants on this element for general loading. [15]
- b) Apply the above equations to obtain the expressions for membrane stresses  $N_x$ ,  $N_\phi$  and  $N_{x\phi}$  for a closed circular cylindrical shell of length  $L$ , radius 'a' subjected to self weight. [10]
- Q6)** a) Explain the need for the bending theory for the analysis of the shell structure. [5]
- b) Describe in brief, the Lundgren's beam theory for thin shells. [5]
- c) For a cantilever cylindrical open shell used for roofing structure, find the membrane stresses due to self weight. [15]



Total No. of Questions :6]

SEAT No :

**P4201**

**[4860] - 450**

[Total No. of Pages : 2

**M.E. (Instrumentation & Control) (Process)**

**a: INDUSTRIAL AUTOMATION**

**(2008 Pattern) (Elective - I) (Semester -I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any two questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data if necessary.*

**SECTION - I**

**Q1)** Develop Programmable Ladder diagram for mixing of two liquids as per below **[25]**

Sequence:

When the start P.B. is pressed, the inlet valve A switches ON till the middle level sensor has not sensed the liquid. When middle level is sensed inlet valve B switches ON till the high level sensor has not sensed the liquid. Then the motor spins the stirrer for 10 seconds for mixing of both the liquids. After this drain valve switches ON and remains on till the low level is not reached.

Also, Explain with suitable block diagram, data flow and number conversions involved in analog I/O operation of PLC.

**Q2)** Draw a famous automation hierarchy for an industrial application. Explain the function of each level. **[25]**

**Q3)** Write notes on: **[25]**

- a) Fuzzy Logic Controller.
- b) SCADA.

**P.T.O.**

**SECTION - II**

**Q4)** What is the significance of SPC in Process Plants? Elaborate with the different type of charts used. **[25]**

**Q5)** Describe in brief power plant process. Develop DCS based automation strategy for the power plant control. **[25]**

**Q6)** What is OPC? Explain with an example, How OPC is actually used in the field? **[25]**



Total No. of Questions :6]

SEAT No :

**P4202**

**[4860] - 453**

[Total No. of Pages : 2

**M.E. (Biomedical Instrumentation)**

**a: FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION  
(5061201) (2008 Pattern) (Semester -I) (Elective- I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*
- 5) *All questions are compulsory.*

**SECTION - I**

- Q1)** a) Explain the amplitude, frequency, and electrodes used for ECG, EEG and EMG biopotentials. Explain various properties of ideal bioelectrode. **[8]**
- b) With the help of neat diagram, describe the structure of Human cell and its functions. **[8]**
- Q2)** a) Define Electrode Offset Potential. How effect of electrode offset potential is reduced? **[8]**
- b) Discuss various lead configurations used for ECG monitoring in detail. **[8]**
- Q3)** a) What is EEG? Describe 10-20 electrode placement used for EEG acquisition. **[10]**
- b) Explain Indicator Dilution method with the dilution curve used for blood flow measurement. **[8]**

**SECTION - II**

- Q4)** a) Define: **[8]**
- i) Microshock.
  - ii) Let go Current.
  - iii) Biofeedback.
  - iv) Afferent Nerves.

**P.T.O.**

- b) Explain conductivity type blood cell counter used for RBC and WBC measurement. [8]
- Q5)** a) State the need of ventilator? What are the different modes of ventilator? [8]
- b) What are various methods to measure respiration rate? Explain any one method in detail. [8]
- Q6)** a) What are main sections of Human auditory system? Explain the function performed by each section in human hearing phenomenon. [8]
- b) Explain the principle of intraocular pressure measurement of indentation and applanation tonometer. [10]



Total No. of Questions :8]

SEAT No. :

**P4525**

**[4860]-455**

[Total No. of Pages :3

**M.E. (Instrumentation) (Process & Bio.)**

**CONTROL SYSTEM DESIGN**

**(2008 Course) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer 3 questions from section - I and 3 questions from section-II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, Slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION -I**

**Q1) a)** Design a lead compensator for a control system having OLTF as **[12]**

$$G(s)H(s) = \frac{1}{s(s+3)(s+5)}$$

It is desired to have peak overshoot for a step input is as 20% and settling time is 5 sec.

b) Explain Lag and Lead compensator. **[6]**

**Q2)** Apply Bode plot method to design a lead compensator for unity feedback system having. **[16]**

$$G(s) = \frac{K}{s^2(s+0.5)}$$

such that P.M.  $\approx 38^\circ$ , G.M. at least 10 dB and  $e_{ss} = 0.2$  rad for unit acceleration input.

**P.T.O.**

**Q3) a)** Design a controller for the following first order system: [8]

$$G_p(s) = \frac{1e^{-2s}}{(25s+1)}$$

Using the direct synthesis approach, and given that the desired closed-loop behavior is:

$$G_{CL} = \frac{1e^{-2s}}{(9s+1)}$$

b) 
$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} \frac{4}{s+3} & \frac{-2e^{-2.9s}}{0.4s+1} \\ \frac{-2e^{-5.5s}}{0.3s+1} & \frac{3}{s+1} \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix}$$
 Find the RGA for the given system. [8]

**Q4)** Consider a unity feedback system has forward path transfer function [16]

$$G(s) = \frac{K}{s(s+8)}$$

Design a digital control scheme for the system to meet the following specifications:

- a)  $K_v \geq 30$
- b) Peak overshoot  $\leq 20\%$ .
- c) Settling time  $\leq 6$  Sec.

### SECTION -II

**Q5)** Determine the state controllability and observability of the system [16]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} -4 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 0 & 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$



**Q6)** Consider a system having transfer function **[16]**

$$G(s) = \frac{2}{s^2 + 6s + 5}$$

Obtain the model state space model. Verify that the system is observable, if so, determine the observer gain matrix using Ackerman's method such that closed-loop poles are at  $s_1 = -2$ ,  $s_2 = -3$ .

**Q7)** A control system represented by the following state equations **[16]**

$$\dot{X} = Ax + Bu$$

Where  $A = \begin{bmatrix} 0 & 1 \\ -3 & -2 \end{bmatrix}$ ,  $B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

The performance index J is given by  $J = \int_0^{\infty} (x^T Qx + u^T Ru) dt$

Where  $Q = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ ,  $R = [1]$

Determine the optimal feedback gain matrix K.

**Q8) a)** Consider the system **[12]**

$$\begin{aligned} \dot{X} &= Ax + Bu \\ y &= Cx \end{aligned}$$

Assume that system is completely state observable. Derive the Ackerman's formula for calculating state feed back gain matrix to place the desired observer closed loop poles at  $s = \mu_1$ ,  $s = \mu_2$ , ...  $s = \mu_n$ .

**b)** With an example explain the concept of robust controller. **[6]**

*EEE*

Total No. of Questions :8]

SEAT No :

**P4203**

**[4860] - 456**

[Total No. of Pages : 2

**M.E. (Instrumentation & Control)**  
**(Process Instrumentation and Biomedical Instrumentation)**  
**ADVANCED SIGNAL PROCESSING**  
**(2008 COURSE) (Semester -II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from each Section.*
- 2) *Answers to the two sections should be written in separate answer-books*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and Steam table is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Explain the term Decimation and Interpolation. Explain interpolation by factor I and obtain an expression for interpolated signal at the output. Draw the respective spectrums. **[18]**

**Q2)** Explain the term Time Frequency Distribution? Compare between STFT and WT distribution as a tool of Time Frequency Analysis? State the Advantages and Disadvantages of one over the other. **[16]**

**Q3)** Explain Adaptive filtering? Describe the LMS algorithm for adaptive filtering. Explain one application of adaptive filtering. **[16]**

**Q4) a)** Explain need and application for power spectrum estimation. **[8]**

b) Write a short Note on AR Model of Stochastic process. **[8]**

**P.T.O.**

## SECTION - II

- Q5)** Explain the theory of sub band decomposition. Explain in brief International Standards for any two of Speech or image or Video compression for personnel communication? [18]
- Q6)** Explain in detail wide sense stationary process? Explain different models of stochastic process? [16]
- Q7)** a) Explain the term Cepstrum. Explain the properties of the Cepstrum. [8]  
b) Enlist various Orthogonal Transformations. Explain any one with properties. [8]
- Q8)** a) Write a Short Note on QMF Filter Banks. [8]  
b) Explain STFT with properties. [8]



Total No. of Questions :6]

SEAT No :

**P4204**

**[4860] - 457**

[Total No. of Pages : 2

**M.E. (Instrumentation and Control) (Process and Biomedical)**  
**ORGANISATIONAL BEHAVIOUR AND MANAGEMENT**  
**(2008 Course) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any two questions from section I and section II.*
- 2) Answer to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What are the management functions? Explain roles and skills of manager. **[15]**
- b) What is organization? What are its key elements? **[10]**
- Q2)** Explain:
- a) Theory X and Theory Y **[13]**
- b) Hygiene theory of motivation **[12]**
- Q3)** a) Explain the basic approaches and contemporary issues in organizational leadership. **[10]**
- b) Define project team. Discuss the role and responsibilities of team members. **[15]**

**SECTION - II**

- Q4)** Explain in detail the stages of group development, group structure and group processes. As a manager, how would you manage various groups to understand group dynamics and measure its effectiveness. **[25]**

**P.T.O.**

**Q5) a)** Define Conflict Management. What are the different conflict handling styles? **[10]**

b) What is industrial fatigue? Explain the stress management techniques. **[15]**

**Q6) a)** Explain in detail the Organizational Dynamics. **[9]**

b) Write short notes on: **[16]**

i) Organization structure.

ii) Human resource policies and practices.



Total No. of Questions :6]

SEAT No :

P4205

[4860] - 458

[Total No. of Pages : 2

**M.E. (Instrumentation and Control)**  
**MODERN CONTROL THEORY**  
**(5061111-A) (2008 Course) (Semester-II) (Elective-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any two questions from each section.*
- 2) *Figures to the right indicate full marks.*

**SECTION - I**

**Q1)** For the transfer function

**[25]**

$$G(s) = \frac{s^3 + 5s^2 + 6s}{s^3 + 6s^2 + 9s + 4}$$

Obtain the state model in

- i) Phase variable canonical form and
- ii) Jordan canonical form

**Q2)** Construct the state models using phase variables if the systems are described by differential equation as below and also draw state diagram for the same. **[25]**

$$4 \frac{d^3 y(t)}{dt^3} + 3 \frac{d^2 y(t)}{dt^2} + \frac{dy}{dt} + 2y(t) = 5u(t)$$

**Q3)** Find the state transition matrix of

**[25]**

$$A = \begin{bmatrix} 0 & 2 & 0 \\ 4 & 0 & 1 \\ -48 & -34 & -9 \end{bmatrix}$$

by Cayley Hamilton theorem.

**P.T.O.**

## SECTION - II

**Q4)** A system is describe by the  $\dot{x} = Ax$  where

$$A = \begin{bmatrix} -1 & -2 \\ 1 & -4 \end{bmatrix}$$

Assume matrix Q to be the identity matrix, solve for matrix P and comment on the stability of the system using the equation  $A^T P + PA = -Q$ . [25]

**Q5)** Consider the sampled data system shown in figure below, obtain closed loop transfer function and unit step response of the system. [25]

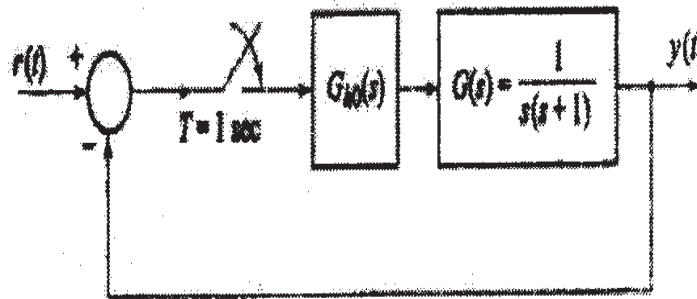


Figure 1: Closed loop sampled data system

**Q6)** Define pulse transfer function. Also find pulse transfer function of PID controller. [25]



Total No. of Questions : 6]

SEAT No. :

P3976

[Total No. of Pages : 2

[4860] - 46

M.E. (Civil) (Structures)

FINITE ELEMENT METHODS

(2008 Pattern) (Semester - II)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any two questions from each section.
- 2) Answer to the two sections should be written in separate books.
- 3) Figures to the right indicate full marks.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Use of non programmable calculator is allowed.
- 6) Assume suitable data, if necessary.

**SECTION - I**

- Q1)** a) Derive element stiffness matrix for one dimensional bar element in local coordinate system by using [15]
- i) Direct stiffness method and
  - ii) Principle of minimum potential energy.
- b) Explain step by step procedure of finite element analysis. [5]
- c) Explain variational methods and their applications in finite element analysis. [5]
- Q2)** a) Determine shape function for a CST element. Prove that the natural co-ordinates are nothing but are co-ordinates for CST element of 2D problem. [15]
- b) State and explain 'Convergence Requirements of displacement function'. [5]
- c) Give three dimensional Pascal's triangle. Explain its use in FEM analysis. [5]

P.T.O.



- Q3)** a) A six noded rectangular element has 4 corner nodes and one node at the centre of the two edges parallel to x axis. The other two edges are parallel to y axis. Obtain the six shape functions using Lagrange interpolation. [12]
- b) Explain the isoparametric concept and types of isoparametric elements in finite element analysis. Discuss their advantages over other elements. [8]
- c) What do you mean by higher order elements? Explain its applications with examples. [5]

## SECTION - II

- Q4)** a) Obtain element stiffness matrix of axisymmetric ring element with a triangular cross section using cylindrical coordinates. [18]
- b) Explain the method of finding shape function for a hexahedral element using natural coordinates. [7]
- Q5)** a) What do you understand by  $C^0$ ,  $C^1$  and  $C^2$  continuity? Explain with suitable examples. [7]
- b) Write displacement functions for both ACM and BFS elements. Verify conformity of both the elements. [18]
- Q6)** a) Explain the concept of degenerated solid elements by suitable examples. [7]
- b) Explain method of obtaining geometry shape functions and displacement functions for Pawsey's eight noded shell element. [18]



Total No. of Questions : 8]

SEAT No. :

**P4206**

[Total No. of Pages : 2

**[4860]-461**

**M.E. (Instrumentation and Control) (Biomedical Instrumentation)**

**a-BIO SIGNAL PROCESSING**

**(2008 Course) (Semester-II) (Elective-II) (5061204 (A))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from section I and section II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Compute the cross-correlation of the sequences,  
 $x(n) = \{2, 3, 4, 1\}$ ,  $y(n) = \{1, 2, 2, 3\}$  [8]
- b) Compute the linear convolution of the sequences, [8]  
 $x(n) = \{2, 3, 4, 1\}$ ,  $h(n) = \{1, 2, 2, 3\}$
- Q2)** a) Determine the unit step response of the system described by,  
 $y(n) = 3y(n-1) + 2y(n-2) + x(n)$  [8]
- b) Explain the properties of Z-transform (any four). [8]
- Q3)** a) Find the 4-point DFT of  $x(n) = \{2, 1, 1, 2\}$  [8]
- b) Sketch the signal flow graph of 8-point decimation-in-frequency (DIF) algorithm. [8]
- Q4)** a) Determine and plot the frequency response of the filter impulse response,  
 $h(n) = \{0.5, 0, 0.5\}$  [9]
- b) Design the causal linear phase FIR filter for following specifications: [9]  
Length  $M = 7$   
Cut-off frequency = 3 rad/sec  
Window function = Hamming window

**P.T.O.**

## SECTION-II

**Q5) a)** A filter operating at a sampling frequency of 1000 samples/sec has a pole at  $z = -1$  and a zero at  $z = -2$ . Determine the magnitude of its amplitude response at 500 Hz, and 600 Hz. [8]

b) Determine the transfer function of a filter described by the difference equation,  $y(n) = y(n-1) - y(n-2) + x(n) + x(n-1)$

Also, sketch the pole-zero plot. [8]

**Q6) a)** A butterworth analog filter has the cut-off frequency 0.707 rad/sec and order  $N = 3$ . Plot the poles on the Butterworth circle. Obtain the transfer function of this analog filter. Using the impulse invariance method, transform this an analog filter  $H(s)$  to a digital filter  $H(z)$ . Assume  $T = 1$  sec. [10]

b) Compare the Butterworth and chebyshev filters. [6]

**Q7) a)** What are the main advantages of adaptive filters over fixed filters? [4]

b) Discuss the LMS algorithm in adaptive filtering. [8]

c) Explain in brief any two medical applications of adaptive filtering. [6]

**Q8) a)** Describe the advantages and disadvantages of modified Huffman coding. [8]

b) What are the various finite word length register effects? [8]

Describe the quantization error in detail.



Total No. of Questions : 6]

SEAT No. :

**P4207**

**[4860]-463**

[Total No. of Pages : 1

**M.E. 2008 (Instrumentation & Control) (Process)**  
**a:ADVANCED PROCESS INSTRUMENTATION**  
**(2008 Course) (Elective - III) (Semester-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any two questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data, if necessary.*

**SECTION -I**

- Q1)** With help of suitable example compare feedback, Feedforward, feedback+Feedforward and cascade control schemes for control of process. **[25]**
- Q2)** Explain with suitable examples (Any two) **[25]**
- a) Ratio Controller.
  - b) Split Range Control.
  - c) Selective Control.
- Q3)** What is the role of Model in Process Control? Derive fundamental model of Stirred Tank Heater. (Assume suitable data) **[25]**

**SECTION -II**

- Q4)** Draw a neat schematic diagram of a fuzzy controller. Comment on the specialty of a fuzzy controller, as compared to other control actions. Explain anyone process where fuzzy controller suits the most with justification. **[25]**
- Q5)** What is the need of Relative Gain Analysis? Explain in brief procedure for calculating Relative Gain Array for  $2 \times 2$  systems. Enlist important properties of RGA. **[25]**
- Q6)** Explain with suitable example, a variety of requirements imposed by designers along with the general requirements, a plant must satisfy. **[25]**

**x x x**

Total No. of Questions : 8]

SEAT No. :

**P4208**

**[4860]-465**

[Total No. of Pages : 2

**M.E. (Biomedical Instrumentation)**  
**BIO-IMAGING MODALITY**  
**(2008 Course) (Elective - III (a)) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Figures to the right indicate full marks.*

**SECTION -I**

- Q1)** a) Explain why we use different methods of imaging for diagnosis. Explain the typical use of different types of imaging. [8]
- b) What is radiation? Differentiate the two types of radiation? [8]
- Q2)** a) Explain the block diagram of X-ray machine in detail. [8]
- b) What are the benefits of Digital Mammography over standard Mammography equipments. Also discuss the limitations of Digital Mammography. [8]
- Q3)** a) Explain the method that overcomes the drawbacks of X-ray imaging system. Explain atleast three image reconstruction methods in the same. [10]
- b) What is the difference between diagnostic mammography and screening mammography? What is magnification mammography? [8]
- Q4)** a) List the factors affecting the spacial resolution of the image in CT scan. Explain atleast two factors in detail. [8]
- b) Discuss Beam Restriction in detail. [8]

**SECTION -II**

- Q5)** a) Explain the different modes in ultrasound imaging system. [10]
- b) Explain Pulse echo-ultrasound A-scan Mode system with block diagram. Also write its applications. [8]

**P.T.O.**

- Q6)** a) Discuss various magnets used in MRI to produce appropriate magnetic field. [8]
- b) Enlist clinical applications of SPECT and give the reason why SPECT is accepted instead of conventional nuclear medical imaging. [8]
- Q7)** a) Explain Medical thermography and the benefits of thermal imaging. [8]
- b) Explain the principle of PET imaging system. Why NaI crystal is popular in nuclear imaging. Which component of PET system makes it costlier system? [8]
- Q8)** a) Draw and explain block diagram of infrared imaging. [8]
- b) Explain the basic principle of MR imaging. Enlist advantages of MRI techniques. [8]

**x x x**

Total No. of Questions : 10]

SEAT No. :

**P4209**

[Total No. of Pages : 4

[4860]-467

**M.E. (Polymer)**

**MATHEMATICAL AND STATISTICAL METHODS**

**(2008 Pattern) (Semester-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION-I**

**Q1) a)** Use Gauss - Seidel method to solve following system of equations:

$$28x_1 + 4x_2 - x_3 = 32$$

$$2x_1 + 17x_2 + 4x_3 = 35$$

$$x_1 + 3x_2 + 10x_3 = 24$$

[8]

b) Solve the following system of equations, using Cholesky's method. [8]

$$x_1 + x_2 + x_3 = 1$$

$$4x_1 + 3x_2 - x_3 = 6$$

$$3x_1 + 5x_2 + 3x_3 = 4$$

**Q2) a)** Find the largest eigen value and corresponding eigen vector of the following matrix using power method.

$$A = \begin{bmatrix} 10 & -2 & 1 \\ -2 & 10 & -2 \\ 1 & -2 & 10 \end{bmatrix}. \text{ Take initial vector as } \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \quad [8]$$

b) Use Newton -Raphson method to solve

$$x + 3\log_{10} x - y^2 = 0$$

$$2x^2 - xy + 5x + 1 = 0$$

with initial values  $x_0 = 3.4, y_0 = 2.2$

[8]

**P.T.O.**

- Q3) a)** Use Householder's method to reduce the following matrix into tridiagonal form: [8]

$$A = \begin{bmatrix} 1 & 4 & 3 \\ 4 & 1 & 2 \\ 3 & 2 & 1 \end{bmatrix}$$

- b) Apply LU decomposition method to solve the system of equations. [8]

$$10x + y + z = 12$$

$$2x + 10y + z = 13$$

$$2x + 2y + 10z = 14$$

- Q4) a)** Find the z-transform of the following (any two): [8]

i)  $f(k) = 2^k + \left(\frac{1}{2}\right)^k, k \geq 0$

ii)  $f(k) = \frac{3^k}{k!}, k \geq 0$

iii)  $f(k) = ke^{-ak}, k \geq 0$

- b) Find z-transform of the convolution [4]

$$f(k) * g(k) * h(k) \text{ where}$$

$$f(k) = \frac{1}{1^k}, g(k) = \frac{1}{2^k}, h(k) = \frac{1}{3^k}, k \geq 0$$

- c) Solve the difference equation: [6]

$$f(k+2) + 3f(k+1) + 2f(k) = 0$$

$$\text{Given } f(0) = 0, f(1) = 1.$$

- Q5) a)** Find the inverse z-transform of the following (any two): [8]

i)  $\frac{z+2}{z^2-2z+1}, |z| > 1$

ii)  $\frac{z}{(z-2)(z-3)}, 2 < |z| < 3$

iii)  $\frac{z^2}{z^2+1}$  using inversion integral method.

- b) Find  $A^{200}$  using Sylvester's theorem where  $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ . [8]



**SECTION-II**

**Q6) a)** Use Runge- Kutta Fourth order method to solve the system at  $x = 0.1$

$$\begin{bmatrix} y' \\ z' \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 1 & -3 \end{bmatrix} \begin{bmatrix} y \\ z \end{bmatrix} \quad [8]$$

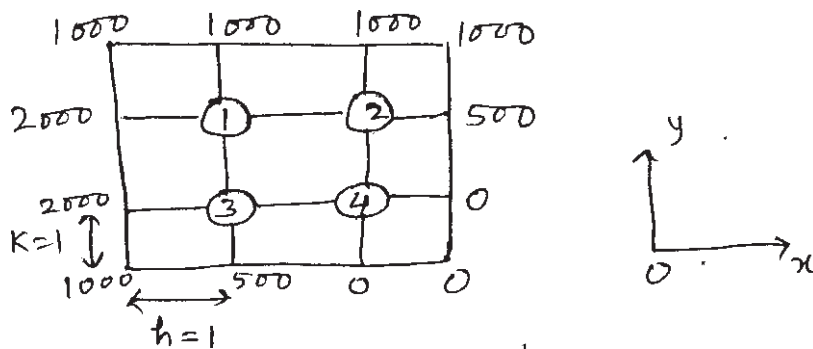
Given that at  $x = 0$ ,  $\begin{bmatrix} y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 0.5 \end{bmatrix}$ , taking  $h = 0.1$ .

b) Determine the solution of  $\frac{dy}{dx} = x - y^2$  at  $x = 0.8$ , given  $y(0) = 0, y(0.2) = 0.0200, y(0.4) = 0.0795, y(0.6) = 0.1762$ . [8]

**Q7) a)** Solve  $\frac{dy}{dx} = \frac{1}{x^2} - \frac{y}{x}$  to calculate  $y(1.2)$  using modified Euler's method taking  $h = 0.1$ , given  $y(1) = 1$ . [7]

b) Evaluate the function  $u(x,y)$  at the points 1, 2, 3 and 4 on the grid where

$$u(x, y) \text{ satisfies the equation } \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0 \quad [9]$$



**Q8) a)** Find the extremal of the functional  $\int_0^1 (y'^2 + 12xy) dx$  with  $y(0) = 0, y(1) = 1$  [8]

b) Use Rayleigh-Ritz method to solve

$$y'' - y + x = 0, (0 \leq x \leq 1), y(0) = 0, y(1) = 0 \quad [8]$$

**Q9) a)** Apply Galerkin's method to solve boundary value problem  $y'' = -x$  with  $y(0) = y(1) = 0$ , taking the approximate solution as [9]

$$\bar{y}(x) = c_1x(1-x) + c_2x^2(1-x)$$

b) Among 64 offsprings of a certain cross between guinea pigs 34 were red, 10 were blue, and 20 were white. According to a genetic model, these numbers should be in the ratio 9 : 3 : 4. [7]

Are the data consistent with the model at 5% level. Given  $\chi_{2,0.05}^2 = 1.44$ .

**Q10)a)** During testing in a sample of 300 chips, 10 have been found to be defective. Can the manufacturer's claim that 2% of the chips are defective may be accepted? [5]

Given  $|z| = 1.96$  at 5% level of significance.

b) There are two different choices to stimulate a certain chemical process. To test whether the variance of the yield is the same no matter which catalyst is used, a sample of 10 batches is produced using the first catalyst and of 12 using second. If the resulting data for variance for first and second catalyst are 0.14 and 0.28 respectively. Test the hypothesis of equal variance at 2% level. Given  $F_{0.02} = 5.02$  for (11,9) degrees of freedom. [6]

c) The average monthly earnings for women in executive positions is Rs. 33,500. A random sample of  $n = 40$  men in the executive positions showed average monthly income Rs. 36,250 with standard deviation Rs. 5100. Do men in the same positive have average monthly earning higher than those for women? Given  $z_\alpha = 1.645$  where  $\alpha = 5\%$  level of significance. [7]



Total No. of Questions : 10]

SEAT No. :

**P4210**

**[4860]-469**

[Total No. of Pages : 2

**M.E. (Polymer Engineering)  
POLYMER PROCESSING AND TESTING  
(2008 Course) (Semester - I) (509117)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Question number 1 & 5 are compulsory. Out of the remaining attempt 2 questions from Section I & 2 questions from Section II.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Numbers to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of logarithmic table, electronic pocket calculator is allowed.*

**SECTION - I**

- Q1)** a) Discuss in detail creep relaxation set and fatigue. [12]  
b) Explain the importance of destructive and non destructive testing. [8]
- Q2)** a) Explain with applicable Tensile Stress-strain curves different types of polymeric materials and give one example of each type. [7]  
b) Explain in detail Crazeing and Shear banding mechanism of deformations [8]
- Q3)** a) Explain effect of polarity, crystallinity and degree of cross linking on the Modulus-Temperature relationship for Polymeric materials. [6]  
b) Write a note on Environmental Resistance properties. [9]
- Q4)** Write a note on : [15]  
Fire Resistance Test.  
Thermal Properties.
- Q5)** a) Explain with one test method importance of barrier properties. [6]  
b) Explain testing of FRP products. [9]

***P.T.O***

## SECTION - II

- Q6)** a) Explain the process, application of Reactive Extrusion in details. [15]  
b) Discuss in detail reaction Injection Molding. [5]
- Q7)** a) Explain with neat diagram Tubing Extrusion die equipped with internally cooled sizing mandrel. Explain most important design consideration used in designing Tube and Pipe Dies. [6]  
b) Explain in detail any two processes used in Thermoforming. [9]
- Q8)** a) Explain with neat sketch of Pipe Extrusion line using Vacuum Sizing. [7]  
b) Explain in detail heat transfer analysis in Thermoforming. [8]
- Q9)** a) Write a short note on different types of blow molding techniques. [8]  
b) Write a note on Reactive Extrusion. [7]
- 10)** Write a short note “Downstream Equipments and Auxiliary Units for Film extrusion Lines” and “Parison Programming” [15]



Total No. of Questions : 6]

SEAT No. :

**P4666**

[Total No. of Pages : 3

**[4860]-47**

**M.E. (Civil Structures)**

**MANAGEMENT IN STRUCTURAL ENGINEERING**

**(2008 Pattern) (Semester - II)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) What are the resources for building construction and explain briefly the role of resource management in planning and controlling productivity.[7]
- b) What do you mean by logistic management? [6]
- c) Write short note on selecting construction equipment. [6]
- d) Write a short note on recruitment. [6]
- Q2)** a) Explain the causes of inadequate durability. [7]
- b) Explain in brief (any two) [10]
- i) Corrosion in structures
  - ii) Quality control of materials of structures
  - iii) Fire safety
- c) Explain the concept of T. Q. M. [8]

**P.T.O.**

- Q3)** a) Explain the carbonation depth measurement test. [7]  
b) List out the information required to be collected after visual inspection of distressed structure. [6]  
c) Compare health monitoring and structural audit. [6]  
d) State and explain different methods of NDT. [6]

**SECTION - II**

- Q4)** a) What are the requirements of structural detailing? Also explain structural detailing for restoration. [10]  
b) Define [7]  
i) Adhesions  
ii) Cross-linking agents  
iii) Catalyst  
iv) Latex  
c) Explain with sketches [8]  
i) Base isolation techniques  
ii) Jacketing to the structural members.
- Q5)** a) Explain the structural aspects for form work in building. [7]  
b) Explain the design of form work with following points. [10]  
i) Load on form work  
ii) Design criteria  
iii) Design procedure  
c) Write short notes on [8]  
i) Safety precautions working at height  
ii) Material handling and stacking

**Q6)** Write short notes on (any five) :

**[25]**

- a) Planning and executing of demolition
- b) Role of structural drawing in demolition of structures.
- c) Recycling of demolished materials
- d) Demolition safety
- e) Saw technique of demolition wire
- f) Factors influencing on reuse of demolished material
- g) Method of implosion.



Total No. of Questions : 8]

SEAT No. :

P4211

[4860]-470

[Total No. of Pages : 2

**M.E. (Polymer Engineering)**

**a : POLYMER REACTION ENGINEERING**

**(2008 Course) (509118) (Elective - I) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Question number 1 & 5 are compulsory. Out of the remaining attempt 2 questions from Section I & 2 questions from Section II .*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Numbers to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of logarithmic table, electronic pocket calculators is allowed.*

**SECTION - I**

**Q1)** Monomer MMA is polymerized in perfectly mixed flow reactor at 80°C. The initial concentration of Styrene is 10.05 gmole/lit, and the concentration of initiator is kept constant at 0.07 gmole/lit throughout the polymerization. The rate constant are as

$k_0 = 3 \times 10^{-8} \text{ sec}^{-1}$  ,  $k_p = 195 \text{ lit/gmole.sec}$  ,  $k_c = 3.6 \times 10^7 \text{ lit/gmole.sec}$ . Volume of reacting mixture is 6000 liters and the reaction time of 320 min.

Find the feed rate of the Initiator, percentage of monomer polymerized, polydispersity index.

Assume same reaction is carried out in Batch reactor find out the change in number average and weight average molecular weight. **[18]**

- Q2)** a) Discuss in detail the applicable model of diffusion effects in step growth polymerization at high conversion. **[6]**
- b) Distinguish between Chain Growth and Step Growth Polymerization. **[5]**
- c) Explain the different mechanism steps for Free Radical Polymerization. **[5]**

**P.T.O.**



**Q3)** Define Instantaneous fractional degree of polymerization and weight degree of polymerization and derive the necessary expression for the Instantaneous fractional degree of polymerization and weight degree of polymerization under free radical polymerization. **[16]**

**Q4)** Explain the following. **[16]**

- a) Tromosdroff Effect.
- b) Characterization of Polymers.

### **SECTION - II**

**Q5)** Discuss in detail kinetics of emulsion Polymerization based on Smith Ewart Model. **[18]**

**Q6)** a) Discuss the effects of micro and macro mixing on polymerization. **[8]**

b) Explain in detail Metallocene based Polymerization for olefins. **[8]**

**Q7)** a) Discuss in detail Emulsion Polymerization Reactor with one application. **[10]**

b) Explain with neat diagram LLDPE Fluid Bed reactor. **[6]**

**Q8)** Write a short note on **[16]**

- a) Control engineering in polymerization process.
- b) Design Consideration in Polymerization reactors.



Total No. of Questions : 8]

SEAT No. :

**P4213**

**[4860]-475**

[Total No. of Pages : 2

**M.E. (Polymer Engineering)  
PACKAGING TECHNOLOGY  
(2008 Course) [509119 [Elective-II] (c)] (Semester-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

**Instructions:**

- 1) *Question number 1 & 5 are compulsory. Out of the remaining attempt 2 questions from Section I & 2 questions from Section II.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Numbers to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of logarithmic table, electronic pocket calculator is allowed.*

**SECTION-I**

**Q1)** Explain in detail different properties for packaging materials. Differentiate between different packaging materials based on the above. **[18]**

**Q2)** a) Explain can lining compounds and lacquers for containers used for food packaging. **[6]**

b) Explain with one example "Principles of Corrosion and its prevention". **[5]**

c) Explain different Physical characteristics of the product. **[5]**

**Q3)** Explain with example characteristics of packaging materials for susceptibility to water, water vapour, and gases. **[16]**

**Q4)** a) Describe in detail product-package relationship influencing Package design. **[6]**

b) Write a note on heat and light effect on packaging materials. **[10]**

**P.T.O.**

## SECTION-II

**Q5)** Discuss in detail different types of adhesives and Theory and principles of adhesion. **[18]**

**Q6) a)** Explain in detail manufacture and applications of Adhesive tapes with examples. **[10]**

b) Distinguish between vegetable, animal, inorganic and synthetic based Adhesives. **[6]**

**Q7) a)** Discuss in detail Types of cushioning materials and properties with one example. **[10]**

b) Explain Resilient materials and Non-Resilient materials used for cushioning materials. **[6]**

**Q8)** Write a short note **[16]**

a) Printing techniques.

b) Sterilization of packaging materials.

**x      x      x**

Total No. of Questions : 8]

SEAT No. :

P4663

[Total No. of Pages : 3

[4860]-478

M.E. (Polymer Engineering)

**PROCESSING & MECHANICS OF COMPOSITES**

**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Q.No. 1 and 5 are compulsory. Answer any other two questions from Section I and any other two questions from Section II.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Answer any four :

**[20]**

- a) Write in short about methods of heat and pressure application and tooling requirement of hand lay-up technique.
- b) How will you determine the normal strain,  $\epsilon_3$ , for orthotropic lamina under plain stress condition?
- c) Draw stress envelop of Tsai-Hill theory and explain why the stress envelop is not continuous space. What is the significance of this?
- d) Write compliance matrix for orthotropic material in terms of engineering constants and reduce it to plain stress condition.
- e) Prove the condition of symmetry for stiffness matrix for orthotropic material  $C_{ij} = C_{ji}$ .

**Q2)** a) Explain the process of pultrusion with a neat sketch. State advantages and limitations of the process. **[8]**

b) Explain the step by step procedure for the determination of engineering constants for unidirectional discontinuous  $0^\circ$  short fiber lamina. **[7]**

**P.T.O.**

**Q3) a)** Show that uniaxial off-axis Tsai-Hill criteria reduces to **[8]**

$$\frac{\cos^4\theta}{X^2} + \left[ \frac{1}{S^2} - \frac{1}{X^2} \right] \cos^2\theta \sin^2\theta + \frac{\sin^4\theta}{Y^2} = \frac{1}{6X^2}$$

where X and Y are tensile or compressive strength in direction 1 or 2 and s is shear strength in 1-2 plane.

**b)** For a lamina following things are known. **[7]**

$$E_1 = 2E_2 \text{ and } G_{12} = E_2 \nu_{12} = 0.3$$

Find  $\nu_{xy}$  at  $45^\circ$

**Q4) a)** Write in short about hygrothermal stresses in a laminate. **[8]**

**b)** Derive an equation for maximum fiber packing fraction for circular fibers arranged in a square array. **[7]**

### SECTION - II

**Q5)** Answer any two : **[20]**

**a)** Give an example of angle ply laminate with stacking sequence. Analyze the [A][B][D] matrices.

**b)** Discuss the assumptions of classical lamination theory and obtain expressions for force per unit width and moment per unit width in terms of [A][B] and [D] matrix.

**c)** Give example of symmetric laminate with multiple specially orthotropic layers and write force and moment relationship for the same. Explain also regular symmetric cross ply laminates and comment on elements.

$$A_{16}, A_{26}, D_{16} \text{ and } D_{26}.$$

**Q6) a)** A pressure vessel is to be designed having 400 mm as diameter with E-glass-epoxy laminate. The internal design pressure for the vessel is 2.1 bar. It is proposed to have symmetric laminate structure with  $[+45/-45]_s$  configuration with each lamina 6 mm thick. Calculate the strain in the laminate. Given – **[9]**

$$[A] = \begin{bmatrix} 962.6 & 806.6 & 0 \\ 806.6 & 962.6 & 0 \\ 0 & 0 & 829.6 \end{bmatrix} \times 10^6 \text{ N/m}$$

$$[D] = \begin{bmatrix} 46.2 & 38.7 & 27 \\ 38.7 & 46.2 & 27 \\ 27 & 27 & 39.8 \end{bmatrix} \times 10^3 \text{ N/m}$$

- b) For a single layered generally specially orthotropic and single layered generally orthotropic laminate, each having thickness of “t”; obtain expression for elements of extensional stiffness, bending stiffness and coupling stiffness matrix in terms of engineering constants. [6]

**Q7)** Determine the safety of the angle ply lamina when subjected to  $\sigma_x = 3\text{MPa}$  at an angle of orientation of  $\theta = 45^\circ$ . The failure strengths in principle material directions are : [15]

$$F_{1T} = 1200\text{GPa}$$

$$F_{1C} = 540\text{GPa}$$

$$F_{2T} = 310\text{GPa}$$

$$F_{2C} = 150\text{GPa}$$

$$F_{12} = 50\text{GPa}$$

The subscript T refers to tensile and C refers to Compression

The engineering constants of the lamina are :

$$E_1 = 45\text{GPa}$$

$$E_2 = 28\text{GPa}$$

$$G_{12} = 7\text{GPa}$$

$$\nu = 0.21$$

Use following failure theories :

- Tsai-Hill
- Maximum stress
- Maximum strain
- Tsai-Wu.

**Q8)** Write down the stiffness matrices for the following types of lamina [15]

- Anisotropic lamina
- Monoclinic lamina
- Generally orthotropic lamina
- Specially orthotropic lamina
- Transversely isotropic lamina
- Isotropic lamina.



Total No. of Questions : 12]

SEAT No. :

P3977

[Total No. of Pages : 3

[4860] - 48

M.E. (Civil - Structures)

**EARTHQUAKE RESISTANT DESIGN OF STRUCTURES  
(2008 Pattern)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non programmable electronic calculator is allowed.*
- 5) *Assume suitable data, if necessary. Answers to each section must be written in seperate answer books.*
- 6) *Use of IS1893 (2002) Part - I is permitted.*

**SECTION - I**

- Q1)** a) What is an earthquake? Explain the causes and classification of earthquake based on different parameters. [6]
- b) Explain the lessons learnt from past earthquakes in India. [6]
- c) Classify and describe types of seismic waves. [6]

OR

- Q2)** a) Describe code based methods of seismic analysis? [6]
- b) What is non-structures? Explain various approaches to deal with non-structures. [6]
- c) What are Isoseismal? Explain their uses? [6]

- Q3)** a) Describe with examples the effect of different irregularities in a structure in an earthquake prone area. [8]
- b) What is soil liquefaction? What are the remedies taken to reduce it? [8]

OR

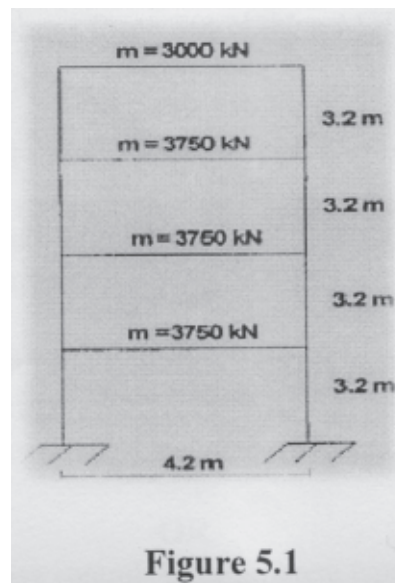
**P.T.O.**

**Q4)** Write notes on:

[16]

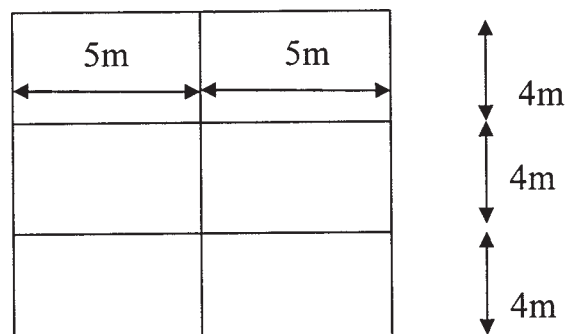
- a) Soft Storey.
- b) Seismograms.
- c) Seismic zoning.

**Q5)** Calculate the distribution of base shear at each floor level as per seismic coefficient method for the OMRF without brick infill building shown in Fig. 5.1 The building is located in Zone V. The frames are spaced at 4m c/c. Assume soil of Type II. [16]



OR

**Q6)** The plan for three storey primary school building is shown in figure 6.1. Assuming OMRF construction and medium stiff soil, determine seismic loads in X-direction on structure. Take D.L. =  $10 \text{ kN/m}^2$  LL =  $3 \text{ kN/m}^2$  and floor height 3.2 m. [16]





## SECTION - II

- Q7)** a) Explain the causes of instability of steel building. Describe the P- $\Delta$  effect? [8]
- b) Explain the procedure to carry dynamic analysis of multistory structure to obtain seismic forces and distribution along the height. [10]

OR

- Q8)** a) Give reasons for poor performance of masonry buildings. How to improve the seismic performance of RC building? [8]
- b) Describe the restoration of masonry buildings. [10]

- Q9)** Design a RC rectangular beam of span 6m supported on RC columns to carry a point load of 150kN in addition to its self weight 3kN/m. The moment due to seismic load is 6kN.m and shear force 30kN. Use M20 grade concrete and Fe250 grade steel. [16]

OR

- Q10)** a) Define shear wall and their classification. Describe behavior of long shear wall. [8]
- b) Discuss advantages and disadvantages of off different types of steel frames in building in earthquake prone area. [8]

- Q11)** a) What is necessity of ductile detailing? Explain with sketches ductile detailing of Beam-Column Joint. [8]
- b) Explain concept of base isolation. Describe different techniques of base isolations. [8]

OR

- Q12)** a) Define Active and Passive control. Write different types of the passive control system and explain any one example. [8]
- b) Explain in detail the non-conventional techniques for retrofitting of RC building. [8]





Total No. of Questions : 6]

SEAT No. :

P4526

[4860] - 484

[Total No. of Pages :2

M.E. (Printing)

**PROBABILITY, STATISTICS AND QUEUING THEORY**

**(2008 Pattern) (Semester-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Assume suitable data, if necessary.*
- 2) *Answer any two from each section.*

**SECTION-I**

**Q1)** The probability of a battle ship being destroyed on a certain mission is 0.02. **[25]**

The navy owns 6 ships for mission. What is the probability for;

- a) Losing one ship.
- b) Losing at most 2 ships.
- c) Losing 3 ships.
- d) Losing none.

**Q2)** Random variable X has the following function: **[25]**

Value of X (x)	0	1	2	3	4	5	6	7
P (x)	0	2k	2k	k	3k	k <sup>2</sup>	2K <sup>2</sup>	7K <sup>2</sup> +K

- a) Find K
- b) Evaluate  $P(x < 6)$ ,  $P(x \geq 6)$ , and  $P(0 < x < 5)$
- c)  $P(X \leq x) > \frac{1}{2}$ , find minimum value of x.

**Q3)** Explain these terms: **[25]**

- a) Quality
- b) X bar chart
- c) U chart
- d) C chart
- e) P chart

**P.T.O.**

## SECTION-II

**Q4)** The values of different sample values are given below, compute centerline upper Control limit and lower control limit for X bar and R charts? **[25]**

Value	Sample-1	Sample-2	Sample-3	Sample-4	Sample-5
X bar	10.5	10.4	10.0	10.5	9.8
R	2.1	1.3	0.4	1.2	2.3

**Q5)** The numbers of weekly customer complaints are monitored at a large hotel using a c-chart. Complaints have been recorded over the past twenty weeks. Develop control limits using the following data, and draw chart. **[25]**

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
No of complaint	3	2	3	1	3	3	2	1	3	1	3	4	2	1	1	1	3	2	2	3	44

**Q6)** Explain about planning an experiment with flow chart? **[25]**

**x      x      x**

Total No. of Questions : 6]

SEAT No. :

**P4214**

**[4860]-486**

[Total No. of Pages : 1

**M.E. (Printing Engineering & Graphic Communication)**

**MODERN TRENDS IN PRINTING**

**(2008 Course) (Semester-I) (508103)**

*Time : 3 Hours]*

*[Max. Marks : 100*

**Instructions:**

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *draw neat diagram wherever necessary.*
- 4) *Figures to the right indicate full marks.*

**SECTION-I**

- Q1)** a) Explain the impact of process parameters on offset print attributes. [15]  
b) Mention the features and applications of offset printing process. [10]
- Q2)** a) Explain the role of fountain roller in flexography. [15]  
b) Anilox roller plays an important role in flexography. Explain. [10]
- Q3)** a) Explain the chemical etching process for a Gravure cylinder. [15]  
b) Describe the configurations of a gravure press. [10]

**SECTION-II**

- Q4)** a) Explain the impact of impression roller on print quality. [10]  
b) Explain the types of impression loading systems. [15]
- Q5)** a) Mention the web loading systems on a press. [10]  
b) Explain the principle and working of Shaftless technology. [15]
- Q6)** a) Explain the factors governing ink transfer in flexo. [15]  
b) Mention the safety precautions to be considered for flexo plates. [10]

**x x x**

Total No. of Questions : 6]

SEAT No. :

**P4215**

[Total No. of Pages : 2

**[4860]-488**

**M.E. (Printing Engineering & Graphic Communication)**

**PRINTING & PACKAGING MATERIALS**

**(2008 Course) (Semester - I) (508104 B) (Elective -I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data wherever necessary.*
- 5) *Figures to right indicate full marks.*

**SECTION-I**

- Q1)** a) Explain materials used for pre-press films, plates, chemicals and light sources. [16]  
b) Discuss Thermal CTP in detail. [9]
- Q2)** a) Factors to be considered for selecting substrate for package. [9]  
b) Explain optical properties of paper. [8]  
c) Comment on metalized films. [8]
- Q3)** a) Explain the identification tests for polyethylene. [16]  
b) Explain the tearing, burning and solubility tests for BOPP. [9]

**SECTION-II**

- Q4)** a) Mention following tests for a substrate: (Any Four) [16]  
i) COF  
ii) Tensile strength  
iii) Modulus of elasticity  
iv) Drop Test  
v) Bond strength
- b) Explain in detail end-use application tests for a package. [9]

**P.T.O.**

- Q5)** a) State and explain various ink drying mechanisms with suitable diagrams. [9]
- b) Explain various types of inks used in packaging printing. [8]
- c) What is surface energy? Its relevance in printing. [8]
- Q6)** a) Write note on Ink Rheology and Effect on Print Quality. [16]
- b) State the causes and remedies of the following: (any three). [9]
- i) Misting
  - ii) Print Mottle
  - iii) Drying in
  - iv) Striations
  - v) Fisheye



Total No. of Questions : 6]

SEAT No. :

P3978

[Total No. of Pages : 2

[4860] - 49

**M.E. (Civil) (Structure) (Semester - II)**

**STRUCTURAL STABILITY**

**(2008 Pattern) (Elective - III)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

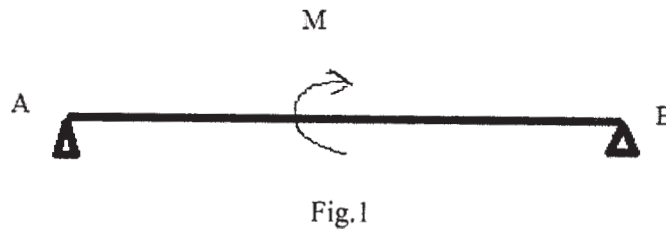
- Q1)** a) Explain the concept of elastic stability and instability of structure with reference to the equilibrium conditions. [10]
- b) What are the methods of stability analysis, explain one method. [10]
- c) Explain stable and unstable equilibrium sketch appropriately. [5]
- Q2)** a) Describe the dynamic approach for column buckling with suitable example. [10]
- b) Derive the higher order governing equation for stability of columns. Hence analyse the column with both ends hinged boundary condition. [15]
- Q3)** a) Stability of structure is an Eigen value problem. Discuss. [10]
- b) Differentiate between elastic buckling and Inelastic buckling of columns. [15]

**P.T.O.**

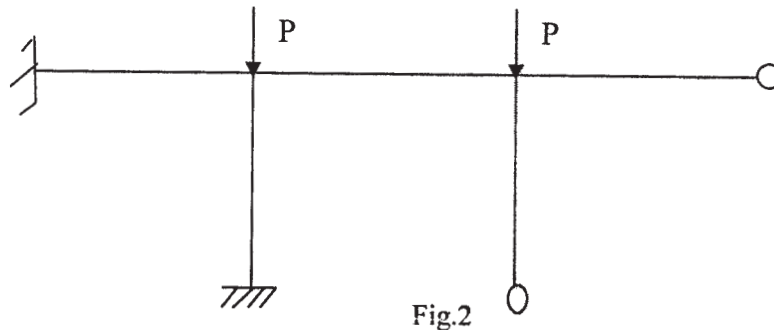


## SECTION - II

- Q4) a)** A beam column subjected to a Concentrated moment  $M$  at the mid span as shown in figure 1. Obtain the expression for maximum deflection and maximum moment. [12]



- b)** Compute the critical load of the frame shown in figure 2 by the energy method. All the members have the same  $EI$  and  $L$ . [13]



- Q5) a)** Explain the equilibrium approach for the buckling analysis of beam columns with example. [10]
- b)** With suitable sketches discuss the different modes of buckling of portal frames. [5]
- c)** Explain Finite Difference method of analysis for stability problem. [10]
- Q6) a)** Explain the role of finite element method in structural stability analysis. What is stress stiffness matrix? [10]
- b)** Derive the governing moment equilibrium equation for the buckling of a thin plate. [15]



Total No. of Questions :6]

SEAT No. :

**P4216**

**[4860]-491**

[Total No. of Pages : 1

**M.E. (Printing Engineering)**

**b-ENTREPRENUERSHIP IN PRINTING & ALLIED FIELDS**

**(2008 Course) (Elective -II) (Semester-I)**

*Time : 3 Hours]*

*[Max. Marks :100*

**Instructions:**

- 1) *Solve any 3 questions from each section.*
- 2) *Figures to the right indicate full marks.*

**SECTION-I**

**Q1)** Define Entrepreneurship Explain deciding factors for success and failure of a entrepreneurship. **[18]**

OR

Explain with example an business idea and creativity.

**Q2)** Explain innovation theory by Schumpeter. **[16]**

OR

Explain Theory of Social change by Everett Hagen.

**Q3)** Explain Production process in detail. **[16]**

OR

Explain detailed steps in Project Report Preparation.

**SECTION-II**

**Q4)** What are important elements of Customer relationship management. **[18]**

OR

Explain Product life cycle concept in detail.

**Q5)** What are entrepreneurship policies ? Explain in detail. **[16]**

OR

Explain how government plays important role in entrepreneurship.

**Q6)** Explain in detail with example, Negotiable instrument act. **[16]**

OR

Explain method and procedure of preparing a Financial Balance sheet.

**x x x**

Total No. of Questions : 6]

SEAT No. :

**P4217**

[Total No. of Pages : 2

**[4860]-492**

**M.E. (Printing Engineering & Graphic Communication)  
QUALITY CONTROL SYSTEM & PRODUCTIVITY  
(2008 Course) (Elective - II) (508105 C) (Semester -I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data wherever necessary.*
- 5) *Figures to the right indicate full marks.*

**SECTION-I**

**Q1)** Answer the following. **[25]**

- a) Explain the role of post press operation in gravure industry.
- b) Distinguish the gravure & flexography process by using different process variables.

**Q2)** Answer the following. **[25]**

- a) Explain the different standard implementation for quality printing.
- b) Explain in detail How to standardize the press.

**Q3)** Answer the following. **[25]**

- a) Explain in detail various registration marks followed in printing industry.
- b) Write short notes on:
  - i) Colour variation
  - ii) Colour deviation
  - iii) CIE LAB

**SECTION-II**

**Q4)** Answer the following. **[25]**

- a) What does management expect from quality control department.
- b) Explain DMAC in six sigma with respect to print process control.

**P.T.O.**

**Q5) Answer the following. [25]**

- a) In automobile filling process 500 gms of certain liquid was to be filled in bags. The permissible variation is  $\pm 5$  gms for investigation the process capability. 5 bags were taken at random from each batch for 10 successive batches & results were plotted as follows.

Batch	1	2	3	4	5	6	7	8	9	10
Mean gms	501	498	500	503	501	500	497	502	503	496
Range	3	4	2	4	3	5	4	2	6	4

Establish control chart limits for  $\bar{X}$  & R chart plot the charts & interpret the meaning.

Take  $A_2 = 0.58$ ,  $D_3 = 0$ ,  $D_4 = 2.11$  will process be able to meet the specifications.

- b) In blade manufacturing factory 1000 blades are examined daily following information shows no of defective blades obtained there. Draw the np chart.

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of defectives	9	10	12	8	7	15	10	12	10	8	7	13	14	15	16

**Q6) Answer the following. [25]**

- a) Design specifications call for a target value of  $16 \pm 0.2$  & observed process o/p mean is 15.9 & std deviation is 0.1.

Calculate process capability & centerdness of process.

- b) 10 samples each of size 50 of a pipe were inspected in pressure testing the result of the inspection are given below.

Sample	1	2	3	4	5	6	7	8	9	10
Defect	2	3	2	0	2	3	2	1	2	3

Draw p- chart & state your conclusion.



Total No. of Questions : 6]

SEAT No. :

**P4218**

**[4860]-494**

[Total No. of Pages : 1

**M.E. (Printing Engineering & Graphic Communication)**

**WEB HANDLING ON PRESS**

**(2008 Course) (508109) (Semester-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

**Instructions:**

- 1) *Answer any two questions from each section.*
- 2) *Answers to two sections should be written in separate books.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Figures to right indicate full marks.*

**SECTION -I**

- Q1)** a) Explain in detail defect identification system for a web. [15]  
b) Explain in detail splicing operation of a web. [10]
- Q2)** a) Explain in detail corona treatment for a web. [10]  
b) Explain in detail preconditioning of a web. [15]
- Q3)** a) Explain in detail tensioning devices. [15]  
b) Explain the various web tension zones. [10]

**SECTION -II**

- Q4)** a) Explain in detail automatic register control system. [15]  
b) Explain in detail cylinder grading. [10]
- Q5)** a) Explain in detail web aligning systems. [15]  
b) Explain in detail dynamic balancing of a roller. [10]
- Q6)** a) Explain the role of web transport on a press. [15]  
b) Explain the importance of type of covering and wrap angle on a press. [10]

**x x x**

Total No. of Questions : 6]

SEAT No. :

**P4219**

**[4860]-495**

[Total No. of Pages : 1

**M.E. (Printing Engineering And Graphic Communication)**

**SUBSTRATE AND INK**

**(2008 Course) (508110) (Semester-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data wherever necessary.*
- 5) *Figures to right indicate marks.*

**SECTION -I**

- Q1)** a) State and explain methods of polymer manufacturing. [15]  
b) Write detailed note on mechanical pulping. [10]
- Q2)** a) Explain various defects in polymers and printability. [16]  
b) State the factors to be considered for selecting substrate for a package. [9]
- Q3)** a) Explain composition of printing ink. [15]  
b) Give typical formulation of Litho printing ink for paper. [10]

**SECTION -II**

- Q4)** a) Write detailed note on specialty inks used in printing. [16]  
b) Explain in detail end-use application tests for a package. [9]
- Q5)** a) Write in detail about the elements of cost estimation. [10]  
b) Calculate the total quantity of paper required for printing 25000 labels in the size 3 × 4 inches. [15]
- Q6)** a) What is Sustainability? [13]  
b) What are environmental laws for print industry? [12]

**x x x**

Total No. of Questions : 6]

SEAT No. :

**P4220**

[Total No. of Pages : 1

**[4860]-498**

**M.E. (Printing Engineering & Graphic Communication)**

**PRESS FINGER PRINTING**

**(2008 Course) (Semester - II) (508111 C) (Elective -III)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data wherever necessary.*
- 5) *Figures to right indicates marks.*

**SECTION-I**

**Q1)** What is finger printing? How it is used in pre-press conditions? **[25]**

**Q2)** a) What is grey-balance? **[10]**

b) What are the variables used for press optimization? **[15]**

**Q3)** a) What is importance of Registration mark. Tracker line, step wedge and autotron lines? **[15]**

b) What is IT-8? **[10]**

**SECTION-II**

**Q4)** How standerdisation is planned for production optimization and maintaining consistancy? **[25]**

**Q5)** What is post finger printing. **[25]**

**Q6)** a) What is process capability and process stability? **[15]**

b) What are the control charts used by statistical Technique? **[10]**



Total No. of Questions : 8]

SEAT No. :

**P4447**

**[4860] - 5**

[Total No. of Pages : 3

**M.E. (Civil) (Construction and Management)**

**b : DISASTER MANAGEMENT**

**(2008 Course) (Elective - I) (Semester - I)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Question No. 1 and 5 are compulsory. Out of the remaining attempt any two questions from Section I and two questions from Section II.*
- 3) *Answers to the two sections must be written in separate answer books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables, slide rule, Moiller charts, electronic pocket calculator and steam tables is allowed.*
- 7) *Assume suitable data wherever necessary.*

**SECTION - I**

- Q1)** a) With the help of suitable examples explain how engineering and technology can be used to save life and property against adverse effects of various natural disasters. **[9]**
- b) Elaborate the causes, effects and management aspects of Man-made disasters. **[9]**
- Q2)** a) Explain the mitigation and management issues in case of Flood disaster as well as earthquakes. **[8]**
- b) Often in post disaster scenario the distribution of relief material is chaotic and erroneous. Explain in detail how you will ensure fair and just distribution of material. **[8]**
- Q3)** a) Explain how an induced earthquake occurs. How disastrous is it as compared to natural earthquakes? **[8]**
- b) Land reclamation process is a recipe for catastrophic natural disaster. Explain this concept in detail with suitable example. **[8]**

**P.T.O.**



**Q4)** A city PQR has experienced a massive earthquake of magnitude 9 on Richter scale. There is substantial loss of life and property. This earthquake has caused a breach in a nearby dam which has flooded the river and low lying areas of the city. You are appointed as the Team Leader for Disaster Response. Explain in detail: **[16]**

- a) How will you organize your team and list out various experts you will have in your team?
- b) Coordination with international relief teams and donor agencies.
- c) Short term and long term relief and management aspects.

### **SECTION - II**

**Q5) a)** It is often said that disasters know no boundaries and religions. How will you manage cross border natural disasters affecting multiple countries? What will be the issues involved: **[9]**

- i) If the countries are friendly.
- ii) If the countries are hostile.

b) It is said that nature provides effective protection against disastrous impact of natural disasters. Explain this statement with suitable examples. **[9]**

**Q6) a)** Enlist various disasters that are related to population growth. Explain any two of these disasters in detail and highlight the relation between occurrence of this disaster and population growth. **[8]**

b) Discuss the measures to be adopted for waste and debris management in disaster affected site as well as relief camps. **[8]**

**Q7) a)** One of the major issues in relief camps is assured and adequate supply of potable drinking water. Explain various criteria considered for selection of appropriate source, ensuring quality and equitable distribution of available water. **[8]**

b) In Indian context list out various government agencies and departments involved in disaster management. Explain in detail the roles and responsibilities of these agencies and departments. **[8]**

**Q8)** Write short notes on:

**[16]**

- a) Role of International donor agencies.
- b) Natural disasters vs. Man made disasters.
- c) Resource planning in Disaster management.
- d) Volcanoes.



Total No. of Questions : 8]

SEAT No. :

**P4463**

**[4860]-50**

[Total No. of Pages : 3

**M.E. (Civil) (Structure) (Theory)**  
**c-STRUCTURAL RELIABILITY**

**(2008 Course) (Semester-II) (Elective-III) (501411)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two Sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) Differentiate between Discrete Variables and Continuous Variables with respect to their probability laws and simple illustrative examples. [6]
- b) The cube strength of concrete, X, follows the normal distribution with the mean and the standard deviation values as 25 N/mm<sup>2</sup> and 5 N/mm<sup>2</sup> respectively. Calculate the probability of getting a value for strength less than 20 N/mm<sup>2</sup>. [6]
- c) Derive an expression for probability of failure for the case of load (S) and resistance (R) following the log normal distribution. [5]
- Q2)** a) Compare critically the conventional methods of structural design with respect to evaluation of safety. [6]
- b) The test results of the cube strength and cylinder strength of seven batches of concrete laid in footings in a day on a construction site are given below: [5]

Sr. No. of Batch	1	2	3	4	5	6	7
Cube Strength (N/mm <sup>2</sup> )	22.07	19.07	24.55	22.39	19.97	18.02	15.75
Cylinder Strength (N/mm <sup>2</sup> )	14.25	12.02	15.30	14.55	12.25	11.47	10.05

**P.T.O.**

Determine the sample covariance and correlation coefficient between cube strength and cylinder strength of concrete.

- c) Define the term 'Structural Reliability' with explanation of each significant element in that definition. [5]
- Q3)** a) Enlist the sources of uncertainty contributing the variation in the strength of concrete. Briefly explain Chi-Square Test to be applied while selecting a probabilistic model fit to the given data. [6]
- b) Derive the expression for 'Reliability Index' for the case of load (S) and resistance (R) following normal distribution. [6]
- c) Derive the expressions for the reliability of a series system and a parallel redundant system. [5]
- Q4)** a) Explain the terms Probability of Failure, Failure rate, Mean Time to Failure. [6]
- b) It is given that the ratio of the mean value of the cube strength of M15 Concrete (design mix) to its characteristic strength is 1.4 and the coefficient of variation of the strength of concrete is 0.18. Determine the allowable stress for the probability of failure of concrete equal to 0.001 and coefficient K value equal to (-3.091) for the given probability. [5]
- c) What is meant by the Lifetime Maximum Sustained Load? Enumerate the assumptions used in the stochastic analysis of it. [5]

## SECTION-II

- Q5)** a) Explain Monte Carlo Method with respect to its objective and procedural steps? [6]
- b) Explain the procedure stepwise to generate normal variates from the distribution of Y following the normal distribution with mean  $\mu$  and variance  $\sigma^2$ . [6]
- c) Write a short note on decision models with designed risk level. [5]

- Q6)** a) Derive the expression for generating log normal variates from the distribution of Y following the lognormal distribution with median of Y (i.e  $\hat{Y}$ ) and standard deviation of lognormal Y (i.e  $\sigma_{\ln y}$ ). [6]
- b) What is meant by Safety Checking Formats for a design code? Explain in brief CEB & LRFD formats. [5]
- c) Explain how the system reliability concept can be extended for decision making with design risk. [5]
- Q7)** a) Derive the expression for partial safety factors specified with respect to the mean values of random variables in the reliability based design of Civil Engineering Structures. [6]
- b) Explain in brief the steps involved in the development of reliability based design criteria. [6]
- c) Write short note on Reliability based design criteria for RCC beams in limit state of collapse calibrated in IS code. Comment on the observations and conclusion on safety factors. [5]
- Q8)** a) Explain how to analyze the risk associated with a decision. [6]
- b) Explain the steps in the development of a reliability based design criteria, to determine the revised partial safety factors for RCC design, as an improvement over the provisions specified in IS: 456. [5]
- c) Write short note on decision tree analysis. [5]



Total No. of Questions : 6]

SEAT No. :

**P4221**

**[4860]-500**

[Total No. of Pages : 1

**M.E. (Printing Engineering & Graphic Communication)  
ADVANCES IN CONVERTING AND PACKAGING  
(2008 Course) (508112 B) (Elective - IV) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

**Instructions:**

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Draw neat diagram wherever necessary.*
- 4) *Figures to right indicate full marks.*

**SECTION -I**

- Q1)** a) Explain the converting process for a product. [15]  
b) Preservation and Protection is a basic requirement for a package. Explain. [10]
- Q2)** a) Explain the finishing process used for publication. [15]  
b) Explain in detail Air Knife Coating process. [10]
- Q3)** a) Explain along with diagram Dry Lamination technique. [15]  
b) Explain along with diagram Wax Lamination technique. [10]

**SECTION -II**

- Q4)** a) Explain in detail blown film extrusion process. [15]  
b) Explain in detail stretch wrapping. [10]
- Q5)** a) Explain in detail Bag-in-Box for liquid products. [15]  
b) Explain the role of PVC in packaging. [10]
- Q6)** a) Explain the deterioration factors for dairy products. [15]  
b) Explain in detail Retort packaging. [10]

**x x x**

Total No. of Questions : 6]

SEAT No. :

**P4222**

[Total No. of Pages : 1

**[4860]-501**

**M.E. (Printing Engineering & Graphic Communication)**

**ANALYSIS OF SPOT AND PROCESS INKS**

**(2008 Course) (Elective - IV) (508112 C)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answers to two sections should be written in separate books.*
- 3) *Draw neat diagram wherever necessary.*
- 4) *Figures to right indicate full marks.*

**SECTION-I**

- Q1)** a) Explain in detail water based inks for gravure process. [15]  
b) Explain in detail solvent based inks for flexo process. [10]
- Q2)** a) Explain the role of resins in flexography inks. [15]  
b) Explain in detail flow property of flexo ink. [10]
- Q3)** a) Explain the rheology of Acrylic inks. [15]  
b) Explain the role of solvents on gravure print quality. [10]

**SECTION-II**

- Q4)** a) Explain the role of plasticizers in offset inks. [10]  
b) Mention the properties of pigments in offset inks. [15]
- Q5)** a) Viscosity of ink has an impact on print quality. Explain. [15]  
b) Explain the role of ink proofing. [10]
- Q6)** a) Explain the impact of press speed and hardness on dot fidelity. [15]  
b) Explain the relation between cell geometry and ink transfer. [10]



Total No. of Questions : 6]

SEAT No. :

P3979

[Total No. of Pages : 2

[4860] - 51

**M.E. (Civil) (Structures) (Semester - II)**  
**NON-LINEAR ANALYSIS OF STRUCTURES**  
**(Elective - III (d)) (2008 Pattern)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of non programmable calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Find approximate solution for a moment-slope non linear analysis of a cantilever beam with point load at the free end. Plot load-deflection curves. **[12]**
- b) Derive the governing nonlinear equation for a moderately thick beam due to stretching. **[13]**
- Q2)** a) Explain 'Displacement Equations Approach' of nonlinear analysis of plates. **[8]**
- b) Write the strain energies due to stretching, bending and kinetic energy of an orthotropic plate. Use Hamilton's principle and stress function approach to derive governing equations. **[17]**
- Q3)** a) State and explain different boundary conditions for the nonlinear analysis of plates obtained from variational technique. **[13]**
- b) State a system of four equations governing the large amplitude flexural vibrations of anisotropic plates. **[12]**

**P.T.O.**



## SECTION - II

- Q4)** Obtain approximate solutions for the tip deflection components of cantilever column at post-buckling stage due non linear behaviour considering moment curvature relationship. **[25]**
- Q5) a)** Explain with diagrams and derivation, the deformation of square pinned-fixed frame for tensile loading. **[15]**
- b) For a two-node truss element, develop the tangent stiffness matrix and force vector corresponding to the configuration at time  $t$ . Consider large displacement and large strain conditions. **[10]**
- Q6) a)** Obtain the displacement transformation matrix for a member with a hinge. **[12]**
- b) Write procedure for elastic plastic analysis of **[13]**
- i) Frames.
- ii) Propped cantilever.



Total No. of Questions : 6]

SEAT No. :

P3980

[Total No. of Pages : 2

[4860] - 52

**M.E. (Civil) (Structures) (Semester - II)**  
**BIOMECHANICS AND BIOMATERIALS**  
**(2008 Pattern) (Elective - IV (a))**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Solve any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Enlist hard and soft tissues with respect to its elastic nature. [8]  
b) Explain various elastic models applicable to biological tissue. Draw suitable diagram to illustrate. [9]  
c) State advantages and applications of study of human Biomechanics. [8]
- Q2)** a) Explain the meaning of Biocompatibility of material in structural sense. [8]  
b) Enlist various biocompatible materials used as application to biomechanics problem and state its suitable application. [9]  
c) What are fixation devices, Enlist and sketch at least three fixation devices. [8]
- Q3)** a) Explain bone cement with its biomedical application, State its advantages and disadvantages, as biomaterial. [10]  
b) Explain engineering properties of stainless steel, cobalt base alloys, Titanium base alloys when used as prosthesis material. [15]

**P.T.O.**

## SECTION - II

- Q4)** a) Explain in brief anisotropy, transverse isotropy, orthotropy for bone tissue. [9]
- b) Explain geometry of the articulating joint for ankle joint, Knee joint, Hip joint. Show joint forces acting on each. [9]
- c) Explain Gait cycle with reference to Human Motion. [7]
- Q5)** a) Enlist various tests as per ASTM standards, carried out for fixation devices like Bone Plate, screws and explain at least one in short. [8]
- b) Enlist and explain various measurement techniques for body motion. [9]
- c) Explain how gait analysis helps in various applications of Biomechanics study. [8]
- Q6)** a) What are the fundamental design considerations for engineering design of Joint replacement prosthesis like Hip joint. [8]
- b) Explain step by step structural design cycle of a fixation device for knee joint. [9]
- c) What is the classification of prosthetic devices? Enlist prosthetics widely used and the situations in which they are required to be used. [8]



Total No. of Questions : 6]

SEAT No. :

P3981

[Total No. of Pages : 2

[4860] - 53

**M.E. (Civil Structures) (Semester - II)**  
**MECHANICS OF MODERN MATERIALS**  
**(2008 Pattern) (Elective - IV (b))**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of nonprogrammable pocket calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain in detail the various types of fibers used for FRPC and give brief information about the matrix of FRPC. [10]
- b) What are the different types and classification of composite materials? [8]
- c) What are advantages of composite materials over the conventional materials? [7]
- Q2)** a) Explain in detail the longitudinal and transverse elastic properties of composite lamina. [10]
- b) Explain two dimensional stress-strain relations for a thin composite lamina. [8]
- c) Write in detail about piezoelectric materials and piezoelectric strain matrix for Quartz. [7]
- Q3)** a) Explain energy based interaction theory (Tsai-Hill) for failure of composite lamina. [13]
- b) Write the comparison between the various failure theories for composite lamina. [12]

**P.T.O.**

## SECTION - II

- Q4)** a) Obtain Naviers equation for orthotropic laminate with two opposite side fixed. [9]
- b) Explain and sketch [16]
- i) Orthotropic, Anisotropic laminate.
  - ii) Symmetric, balanced laminate.
  - iii) Antisymmetric and cross ply laminate.
- Q5)** a) Explain laboratory tests to determine mechanical properties of composite laminate. [10]
- b) Find coefficient of thermal expansion for a 90 degree orthotropic laminate.
- $E_1 = 62 \text{ Gpa}, \quad E_2 = 15 \text{ Gpa}, \quad E_3 = 16 \text{ Gpa}$
- $\mu_{12} = 0.29 = \mu_{21}$
- $\alpha_1 = 0.95 * 10^{-6} / \text{c}^0, \quad \alpha_2 = 27 * 10^{-6} / \text{c}^0.$  [15]
- Q6)** a) Explain manufacturing process of composite. Sketch important details. [8]
- b) Explain in details one experimental tests carried out for determination of properties of composite. [9]
- c) What are high performance of composites, State its future as emerging material. [8]



Total No. of Questions : 6]

SEAT No. :

P3982

[Total No. of Pages : 2

[4860] - 54

**M.E. (Civil) (Structures)**  
**THEORY OF PLASTICITY**  
**(2008 Pattern) (Open Elective)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *All questions carry equal marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Derive the equations of equilibrium of 3D elasticity problem and show that shear stresses are complimentary. [10]
- b) Explain constitutive relations for plane stress, plane strain and axisymmetric problems. [10]
- c) Derive the stress compatibility conditions for 2D plane stress problem. [5]
- Q2)** a) Explain in brief Tresca's and Von-Mises-Hencky's yield criteria. [10]
- b) Describe geometrical representation of the yield surface in the principle stress. [10]
- c) Write short note on convexity of yield surface. [5]
- Q3)** a) Explain theories of plastic flow. [10]
- b) Explain in brief Drucker's stability postulates. [10]
- c) Explain factors affecting plastic deformations of the metal. [5]

**P.T.O.**

## SECTION - II

- Q4)** a) Explain in brief Prager's and Ziegler's kinematic hardening model. [10]  
b) Explain initial and subsequent yield surface in tension. [10]  
c) What is Mises flow rule for isotropic hardening? [5]
- Q5)** a) Derive the equations of radial ( $\sigma_r$ ) and transverse ( $\sigma_\theta$ ) stresses for the section of wide plate subjected moments at the ends. [15]  
b) State and explain uniqueness theorems. [10]
- Q6)** a) Explain convergence criteria for displacement function in finite element analysis. [5]  
b) What are the advantages of isoparametric elements over conventional elements. [10]  
c) Explain finite element models for plasticity problems. [10]



Total No. of Questions : 6]

SEAT No. :

P3983

[Total No. of Pages : 2

[4860] - 55

M.E. (Civil) (Structures)

OPTIMIZATION TECHNIQUES

(2008 Pattern) (Elective - IV (d))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any two questions from each section.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.

**SECTION - I**

- Q1)** a) Determine the maximum and minimum values of the function;  
 $F(x) = 12x^5 - 45x^4 + 40x^3 + 5$ . [10]
- b) Define Saddle Point and its significance. [5]
- c) State the various methods of a multivariable optimization problem with equality constraints. [10]
- Q2)** a) Explain Post Optimality Analysis and Decomposition Principle in Linear Programming. [12]
- b) Solve the following LP problems by the revised simplex method. [13]
- Minimize  $f = -5x_1 + 2x_2 + 5x_3 - 3x_4$
- Subject to  $2x_1 + x_2 - x_3 = 6$
- $3x_1 + 8x_3 + x_4 = 7$
- $x_i \geq 0, i=1 \text{ to } 4$
- Q3)** a) What is the difference between Fibonacci & Golden Section Method. [7]
- b) What is the different between quadratic & cubic interpolation methods. [7]
- c) Find the minimum of  $f = x(x - 1.5)$  in the interval (0, 1) to within 10% of the exact value. [11]

P.T.O.



## SECTION - II

- Q4)** a) What is the unconstrained minimization problem? Give broad classification of Direct Search and Descent Methods. [13]
- b) Differentiate Steepest Descent (Cauchy) and Newton's Method. [12]
- Q5)** a) Explain Direct and Indirect methods of constrained optimization techniques. [13]
- b) Formulate the problem of determining the cross-sectional dimensions of the cantilever beam for minimum weight. [12]
- Q6)** a) Explain with suitable sketch architecture of artificial neural network. [10]
- b) Explain with suitable sketch Selection, Crossover and Mutation Operator in Genetic Algorithms. [10]
- c) Elaborate applications of Artificial Neural Network and Genetic Algorithms to Structural Engineering. [5]



Total No. of Questions : 6]

SEAT No. :

**P4464**

**[4860]-56**

[Total No. of Pages : 4

**M.E. (Civil) (Environmental Engg.)**  
**NUMERICAL METHODS & APPLIED STATISTICS**  
**(2008 Course) (Semester-I)**

*Time : 4 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two Sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator, and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*
- 7) *All questions carry equal marks.*

**SECTION-I**

**Q1) a)** Solve the system of equations given by

$$4x + y + 2z = 7$$

$$3x + 5y + z = 4$$

$$x + y + 3z = 3$$

Using

- i) Gaussian Elimination Method.
  - ii) Gauss seidel Iteration schemes.
  - iii) Compare rate of convergence of both schemes. **[15]**
- b) Solve the system of equations  $x^2 + xy - 15 = 0$ ,  $y + 3x y^2 - 60 = 0$  using Newton - Raphson Method. **[10]**

**Q2) a)** Maximize  $F = x_1 + 2x_2 + x_3$ ,

subject to  $2x_1 + x_2 - x_3 \leq 2$ ,

$$-2x_1 + x_2 - 5x_3 \geq -6,$$

$$4x_1 + x_2 + x_3 \leq 6,$$

where  $x_i \geq 0$ ,  $i = 1, 2, 3$ , using Simplex Algorithm.

**[15]**

**P.T.O.**

b) The following table gives the length of life of 400 instruments. [10]

Length of life (hours):	1000-1199	1200-1399	1400-1599	1600-1799	1800-1999
No. of Instruments:	12	30	65	78	90

Length of life (hours):	2000-2199	2200-2399	2400-2599	2600-2799
No. of Instruments:	56	36	25	9

Calculate:

- i) Average life of Instruments.
- ii) Standard deviation of length of life of an instrument.
- iii) Percentage number of instruments where length of life of instruments falls within  $\bar{X} \pm 2\sigma$ .

**Q3) a)** Calculate the coefficient of skewness and kurtosis based on following data. [15]

$x$ :      4.5      14.5      24.5      34.5      44.5      54.5      64.5

$f$ :      1      5      12      22      17      9      4

$x$ :      74.5      84.5      94.5

$f$ :      3      1      1

b) Write short note on Absolute Measures of skewness and Relative measures of skewness. [10]

### SECTION-II

**Q4) a)** The number of defects per unit in a sample of 330 units of manufactured product was found as follows. [8]

No. of defects:    0      1      2      3      4

No. of units:      214    92    20    3      1

Fit a poisson distribution to the above data and test goodness of fit.

b) Fit a normal curve to the following data [8]

Variable:	60-62	63-65	66-68	69-71	72-74
Frequency:	5	18	42	27	8

c) Let 'x' be a continuous random variable with probability density function

$$f_x(x) = kx^2 \quad 0 < x < 1$$

$$= 0 \quad \text{else}$$

Where 'k' is a constant [9]

i) Determine the value of 'k' and sketch  $f_x(x)$ .

ii) Find  $p\left(\frac{1}{4} < x < \frac{1}{2}\right)$ .

iii) Sketch cumulative distributive function  $f_x(x)$ .

Q5) a) A firm selling four products is interested in finding out whether the sales are distributed normally among four general classes of customers. A random sample of sales record provides following information. [15]

Customers Group	Products				Total
	1	2	3	4	
A	25	10	30	15	80
B	32	20	10	28	90
C	35	48	25	40	148
D	28	22	15	17	82
Total	120	100	80	100	400

i) Formulate a suitable hypotheses.

ii) Apply  $\chi^2$  - test.

iii) Obtain conclusions that can be drawn from the results.

- b) Write short notes (Any Two) on following: [10]
- i) Confidence interval estimation.
  - ii) F - Test.
  - iii) T - Test.

**Q6)** a) The following table gives the aptitude test scores and productivity indices of 10 workers selected at random. [10]

Aptitude scores (x): 60 62 65 70 72 48 53

Productivity index (y): 68 60 62 80 85 40 52

Aptitude scores (x): 73 65 82

Productivity index (y): 62 60 81

Calculate regression equations and estimate:

- i) Productivity index of a worker whose test score is 92.
  - ii) Test score of a worker whose productivity index is 75.
- b) Write short notes on the following: [15]
- i) Analysis of variance.
  - ii) Latin square design.
  - iii) Utility of Time Series Analysis.



Total No. of Questions : 10]

SEAT No. :

**P4465**

**[4860]-57**

[Total No. of Pages : 2

**M.E. (Civil-Environmental Engg.)  
AIR POLLUTION AND CONTROL  
(2008 Course) (Semester-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answers any three questions from Section-I and Section-II.*
- 2) Each question carries equal marks.*
- 3) Figures to the right indicate full marks.*
- 4) Your answers will be valued as a whole.*
- 5) Assume suitable data, if necessary.*

**SECTION-I**

- Q1)* a) Discuss the classification of Air pollutants and their sources.  
b) Discuss with suitable example the photochemical smog in detail.
- Q2)* What is temperature lapse rate? What it's contribute in Air pollution.
- Q3)* With suitable sketches discuss the different cases of plume behavior.
- Q4)* Explain what is dispersion Model? How concentration of air pollutants is worked out.
- Q5)* Discuss in details about stack height and mixing depth.

**SECTION-II**

- Q6)* Discuss what is sampling method for air pollutants. Explain any two in details.

***P.T.O.***

**Q7)** Discuss the followings:

- a) Air Quality Standards.
- b) Cyclone separators.

**Q8)** Give note on the following and explain:

- a) Gaseous Pollution and its control.
- b) Composition of Auto Exhaust.

**Q9)** Discuss in details about Air pollution survey.

**Q10)** Discuss in details any one case study of Air pollution within India.



Total No. of Questions : 8]

SEAT No. :

**P4658**

[Total No. of Pages :2

**[4860]-58**

**M.E. (Civil) (Environmental Engg.)**

**Physico-Chemical Process for Water and Wastewater Treatment  
(2008 Pattern)**

*Time : 3 Hours]*

*[Maximum Marks : 100*

*Instructions to the candidates:*

- 1) *Answer Any Three questions from each Section.*
- 2) *Use of non programmable calculators are allowed.*
- 3) *Neat sketches to be drawn wherever necessary.*
- 4) *Make suitable assumptions if necessary.*
- 5) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** Discuss the principle of suspended growth process for wastewater treatment. Explain in brief various operational problems commonly encountered in activated sludge treatment plants and discuss suitable remedial measures for the same. **[18]**
- Q2)** Explain the significance of drinking water quality criteria and its importance in the design of drinking water quality standards. **[16]**
- Q3)** Discuss the effect of modern lifestyle on quality of sewage generated? Draw the flow diagram for treating the domestic sewage generated from urban areas. Explain the concepts on which the design is based. **[16]**
- Q4)** Write short note the following (All) **[16]**
- a) Perikinetic flocculation and ortho kinetic flocculation.
  - b) Stream standard and effluent standard.
  - c) Double layer theory of particle destabilization.
  - d) Tertiary treatment options.

**P.T.O.**



## SECTION - II

- Q5)** Discuss the working principles of dual and multimedia filters. Also explain the design of pressure filters. **[16]**
- Q6)** Discuss the theory of disinfection by chloramines. **[16]**
- Q7)** Discuss the process of reverse osmosis and Nanofiltration. **[16]**
- Q8)** Write short note the following (All) **[3×6=18]**
- a) Disinfection by UV radiation.
  - b) Ultrafiltration.
  - c) Operational problems of rapid sand filters.



Total No. of Questions : 8]

SEAT No. :

P3953

[4860] - 6

[Total No. of Pages : 2

**M.E. (Civil) (Construction and Management)**  
**REPAIRS, REHABILITATION, RETROFITTING OF STRUCTURES**  
**(2008 Pattern) (Elective - I)**

*Time :4 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Question No 1 and 5 are Compulsory. Out of the remaining attempt any two questions from Section I and two questions from Section II.*
- 2) Answers to the two Sections must be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)* Discuss in brief about repairs retrofitting and rehabilitation with an example. And explain the method of retrofitting of RCC structure? **[8+10]**
- Q2)* Explain the factors to be considered for selection of repairs methods and its different stage and the aramid and carbon fiber wrappings procedure with suitable example? **[8+8]**
- Q3)* Explain in details about rehabilitation procedures for under water dam foundation? What are Predictive performance models and its advantages? **[8+8]**
- Q4)* Explain the use of nanotechnology for repairs, rehabilitation and types of various types of fiber wrappings? **[8+8]**

***P.T.O.***

## SECTION - II

- Q5)** Write about the chemical used for repairs, rehabilitation and retrofitting and Discuss in brief about the procedure adopted by BIFR for a heritage building? **[8+10]**
- Q6)** Elaborate the factors consider by earthquake engineer for rehabilitation a multi-storied building in India. **[16]**
- Q7)** State the data collection required for maintenance of heritage port and types of seismic retrofitting with fig.? **[8+8]**
- Q8)** What are the new materials used in repairs, rehabilitation? Draw types of seismic retrofitting with neat figure. **[8+8]**



Total No. of Questions : 8]

SEAT No. :

P3984

[Total No. of Pages : 2

[4860] - 60

**M.E. (Civil) (Environmental Engineering)**

**ENVIRONMENTAL LEGISLATION AND MANAGEMENT  
SYSTEM**

**(2008 Pattern) (Elective - I (b))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from each section.*
- 2) Figures to the right indicate full marks.*
- 3) Assume suitable data if necessary clearly mentioning the same.*
- 4) Use of non - programmable scientific calculator is allowed.*

**SECTION - I**

- Q1)** a) Write note on : **[8]**
- i) Multilateral environmental agreements
  - ii) Rio Declaration
- b) Write note on EPA. **[8]**
- Q2)** a) Explain water sampling procedure under Water Act 1974. **[8]**
- b) What are the powers and functions of central Pollution Control Board in controlling air Pollution? **[8]**
- Q3)** a) Write penalties for violation of consent conditions under Water Act, 1974. **[8]**
- b) Explain the provision relating to prevention and control in Air Act, 1981. **[8]**

***P.T.O.***

- Q4)** a) Explain concept of absolute liability with example. [9]  
b) Explain institutional framework of MPCB. [9]

**SECTION - II**

- Q5)** a) Explain coastal zone regulation under EPA 1986. [8]  
b) Write and explain the responsibilities of pollution control board under hazardous waste rules. [8]

- Q6)** a) Write the objectives of ISO 14000 and its application. [8]  
b) Explain the procedure of ISO 14001 for any industry. [8]

- Q7)** a) Write short note on Environmental audit. [8]  
b) Explain international and national efforts for environmental protection. [8]

- Q8)** a) Write note on municipal solid waste management. [9]  
b) Write environmental policy and laws. [9]



Total No. of Questions : 8]

SEAT No. :

**P4223**

[Total No. of Pages : 2

**[4860]-602**

**M.E. (Civil) (Water Resources and Environmental Engineering)**

**ENVIRONMENTAL MANAGEMENT**

**(2012 Pattern) (501602) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Question No. 1 and 5 are compulsory and answer any two from remaining 3 questions of each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION-I**

**Q1)** Explain in detail methodology and processes for Environmental Impact Assessment and write a report on Rapid Environment Assessment for a multipurpose reservoir. **[18]**

**Q2)** Discuss the systematic methodology for assessing Environmental Impact due to noise of any project activity. **[16]**

**Q3)** What is meant by social assessment? Why socioeconomic impacts are important in EIA of a major development project? **[16]**

**Q4)** Write down national and international scenario on Agrochemical pollution and measures **[16]**

**SECTION-II**

**Q5) a)** State Timeline of Environmental Laws and Regulations in India. Explain major legislative provisions in Environmental protection Act 1986. **[10]**

**b)** Write a short note on Indian forest Act 1950. **[8]**

**P.T.O.**

- Q6)** a) Write a short note on. **[4]**
- i) Economic tools for Environmental Management.
  - ii) Quantity rationing for environmental protection.
- b) Explain Environmental management system in line with ISO 14000. **[12]**
- Q7)** a) The issues and challenges due to Global Warming in environment management. **[6]**
- b) Explain the role of CPCB and state pollution control board in India. **[10]**
- Q8)** Explain Economic incentives related to Environmental protection with the help of following points.
- a) Price rationing
  - b) Liability rules
  - c) Quantity rationing. **[16]**



Total No. of Questions : 8]

SEAT No. :

**P4224**

[Total No. of Pages : 3

**[4860]-603**

**M.E. (Civil) (WREE)**

**ADVANCED FLUID MECHANICS**

**(2012 Course) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, and non - programmable electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary and state it.*

**SECTION-I**

- Q1)** a) Derive the most general form of equation of continuity in three dimensional cartesian co-ordinate system. **[9]**
- b) A flow pattern is developed by combining uniform flow of velocity  $U$  m/sec, a source of flow rate of  $10\pi$  m<sup>3</sup>/sec/m and a sink of flow rate of  $5\pi$  m<sup>3</sup>/sec/m located at 4 m downstream from the source. Calculate the magnitude of  $U$  if the stagnation point is located 2 m upstream from the source. Also calculate the width of the stream surface enclosing the excess discharge from the source. **[9]**
- Q2)** a) In what respects are Navier Stokes' equations different from Euler's equations both for three dimensional flow in cartesian co-ordinate system? Starting from Euler's equations of motion derive Navier-Stokes' equations. **[8]**
- b) Starting from Navier-Stokes' equations or otherwise, show that for laminar flow in a circular pipe, the velocity distribution is parabolic. **[8]**

**P.T.O.**



- Q3)** a) Derive Von Karman's momentum integral equation for boundary layer flow under the condition of zero pressure gradient. [8]
- b) What is the general form of velocity distribution equation for laminar boundary layer flow as suggested by Karman and Pohlhausen. Explain the essential and desirable boundary conditions which must be satisfied by the assumed velocity distribution equation.  
Check the validity of the velocity distribution equation.

$$\frac{u}{U} = 2\frac{y}{\delta} - 2\frac{y^3}{\delta^3} + \frac{y^4}{\delta^4} \text{ in the light of these boundary conditions. [8]}$$

**Q4)** Write short notes on. [16]

- a) Flow net.
- b) Solution of Laplace equation by relaxation method.
- c) Simple couette flow.
- d) Turbulent boundary layer.

## SECTION-II

- Q5)** a) Explain the statistical theory of turbulence. [6]
- b) Distinguish between isotropic turbulence and homogeneous turbulence. [6]
- c) Explain probability density function. [6]

- Q6)** a) State and explain the various semi-empirical theories developed to determine the magnitude of shear stresses in turbulent flow. [8]
- b) A rough pipeline of diameter 150 mm carries water at the rate of 112.5 litres per second. If the average height of roughness protrusions on the inner surface of the pipe is 0.15 mm, calculate the friction factor, maximum velocity, shear stress at the pipe surface and shear velocity. Take the kinematic viscosity as  $1 \times 10^{-6} \text{ m}^2/\text{sec}$  and mass density as  $1000 \text{ kg/m}^3$  for water at  $20^\circ\text{C}$ . [8]

**Q7) a)** Show that celerity of a sound wave in a fluid medium is given by

$C = \sqrt{\frac{dp}{d\rho}}$ . Hence show that (i) for a perfect gas,  $C = \sqrt{KRT}$  and (ii) for

a liquid  $C = \sqrt{\frac{k}{\rho}}$ . Notations have usual meanings. **[10]**

b) Calculate the pressure on the nose of a modern aeroplane moving at a speed of 900 kmph through still air. Also calculate the mach number. Take the atmospheric pressure and air temperature as 69.5 kN/m<sup>2</sup> and -2°C respectively and mass density of air as 1.29 kg/m<sup>3</sup>. **[6]**

**Q8)** Write short notes on: **[16]**

- a) Mechanism of turbulence.
- b) Moody's diagram.
- c) Pitot sphere.
- d) Normal shock wave.



Total No. of Questions : 8]

SEAT No. :

**P4225**

[Total No. of Pages : 3

**[4860]-604**

**M.E. (Civil) (Water Resources and Environmental Engineering)**

**a - GROUND WATER CONTAMINATION AND TRANSPORT**

**(2012 Pattern) (Semester - I) (Elective-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Attempt any three questions from section I and any three questions from section II.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right side indicate full marks.*
- 5) Use of calculator is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Discuss with help of sketch various groundwater formation. [6]
- b) Define the following terms and briefly discuss their significance. [8]
- i) Porosity
  - ii) Permeability
  - iii) Transmissibility
  - iv) Specific yield
- c) In a flow net analysis, the number of flow line is 18 and the number of hydraulic head drop is 6. Flow is occurring in a medium having hydraulic conductivity 0.005cm/sec and head loss is 30m. Calculate the average discharge. [4]
- Q2)** a) Discuss in detail laboratory method of determination of hydraulic conductivity either by falling head or constant head method. [8]
- b) In a field test, a tracer took 8 hours to travel between two observation wells which are 56m apart. The difference in water table elevations in these well were 0.7m. The volume of void of the aquifer is 30% of the total volume of the aquifer. Calculate the hydraulic conductivity and intrinsic permeability of the aquifer. Viscosity of water is  $0.993 \times 10^{-3}$  Ns/m<sup>2</sup>. [8]

**P.T.O.**

- Q3)** a) What are the different methods to obtain solution to groundwater flow equation? Explain in detail. [8]
- b) State Darcy's law. Groundwater flows through an aquifer with a cross sectional area of  $1.0 \times 10^4 \text{ m}^2$  and a length of 1500m. Hydraulic heads are 300m and 250m at the ground water entry and exit points in the aquifer, respectively. Groundwater Discharges into a stream at the rate of  $1555 \text{ m}^3/\text{day}$ . What is the hydraulic conductivity of the aquifer? If the porosity of the material is 0.3, what is pore velocity of water? [8]
- Q4)** Write note on [16]
- a) Role of groundwater as a source of water resource of the country.
- b) Aquifer exploration
- c) Hydrologic cycle
- d) Effect of sewage disposal on land.

## SECTION-II

- Q5)** a) Define artificial recharge. Discuss in detail different methods of artificial recharge. [8]
- b) Explain the groundwater resources development in the view of groundwater pollution. [6]
- c) Discuss the role of adsorption in organic chemical transfer of soil. [4]
- Q6)** a) Explain dispersion analysis of contaminants transport in fractured rock. [4]
- b) Discuss [6]
- i) Molecular diffusion
- ii) Homogeneous reaction
- as applied to contaminant transport
- c) Discuss tracer test for spreading of contamination in groundwater with the help of breakthrough curve. [6]

- Q7)** a) Explain the advantages and disadvantages of numerical methods in groundwater problem. State different numerical methods and discuss finite difference method. [6]
- b) In context of contaminant transport explain the measurement of parameters such as velocity and dispersivity. [6]
- c) Discuss the field measurement of index parameters such as pH, redox potential, dissolved oxygen and electrical conductance. [4]

**Q8)** Write note on [16]

- a) Environmental isotopes
- b) Oxidation and reduction process
- c) Salt water intrusion
- d) Sources of groundwater contamination



Total No. of Questions : 8]

SEAT No. :

P4226

[4860]-605

[Total No. of Pages : 2

**M.E. (Civil) (WREE)**  
**HYDROLOGY AND GROUNDWATER**  
**(2012 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary..*

**SECTION - I**

**Q1) a)** What is Depth-Area - Duration curve? Enumerate step by step procedure for drawing DAD curves. **[8]**

b) The ordinates of 4 hr unit hydrograph of a basin in m<sup>3</sup>/s at one hour interval are as follows.

4, 25, 44, 60, 70, 61, 52, 45, 38, 32,

27, 22, 18, 14, 11, 8, 6, 4, 2, 1,

Calculate the area of basin and derive the ordinates of 2 hr unit hydrograph. **[8]**

**Q2) a)** Discuss 'Infiltration' as one of the most important parameters affecting runoff. **[8]**

b) Write a short note on time series. **[8]**

**Q3) a)** How the design flood is determined for a water resource project. **[8]**

b) Explain Gumbel's method. **[8]**

**P.T.O**

**Q4)** Write short note on **[18]**

- a) Methods of control evaporation loss.
- b) Flood Lift.
- c) Envelop curve.

**SECTION - II**

**Q5)** a) Briefly explain the processes of seepage and percolation. **[8]**

- b) A well with a radius of 0.4 m completely penetrates an unconfined aquifer of thickness 45 m and  $K = 30$  m/day. The well is pumped so that the water level in the well remains at 35 m above the bottom. Assuming that pumping has essentially no effect on water table at  $R = 400$  m, what is the steady state discharge? **[8]**

**Q6)** a) Write a note on ground water quality. **[8]**

- b) Write a note on ground water quantamination. **[8]**

**Q7)** a) Explain about ground water recharge. **[8]**

- b) Write a note on effective exploitation of ground water potential. **[8]**

**Q8)** Write a short notes on **[18]**

- a) Ground water salinity.
- b) Types of strainers.
- c) Method of images.



Total No. of Questions : 8]

SEAT No. :

P4227

[4860]-607

[Total No. of Pages : 2

**M.E. (Civil) (Water Resource and Environmental Engg.)**  
**d - SOLID & HAZARDOUS WASTE MANAGEMENT**  
**(Elective - I) (2012 Pattern) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidate:*

- 1) *Answers to the two sections should be written in a separate answer books.*
- 2) *Attempt three Questions from each section.*
- 3) *Figures to the right indicates full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

**SECTION - I**

- Q1)** What is source reduction? What can people do to support source reduction?  
Is source reduction good for the environment? **[16]**
- Q2)** What are the types of solid wastes? Discuss the composition of solid waste.  
Also differentiate between biodegradable and non-biodegradable solid wastes.  
**[16]**
- Q3) a)** Estimate the moisture content of solid waste sample with following  
composition : **[10]**

Component	Per cent by mass	Moisture (%)
Food wastes	20	70
Paper	40	6
Card board	10	5
Plastics	5	2
Garden trimmings	5	60
Wood	5	20
Tin cans	5	3

- b) Explain with neat sketch deep well injection method of liquid-solid waste disposal. **[6]**

**P.T.O.**



**Q4)** Write notes on:

- a) Water Balance in Landfills. [6]
- b) Pyrolysis. [6]
- c) Incineration. [6]

**SECTION - II**

**Q5)** Classify the solid waste, giving suitable examples for each of them. Also explain the different methods of disposal of solid waste. [16]

**Q6) a)** Define Hazardous waste and draw decision tree to define Hazardous waste for phase - I [8]

b) Explain the term Solidification and encapsulation in case of Hazardous waste. [8]

**Q7)** Explain Household hazardous waste and discuss various locations of hazardous household waste. [16]

**Q8)** Write notes on :

- a) TCLP tests. [6]
- b) Handling and storage of Hazardous waste. [6]
- c) Geo-technical aspects of landfill sites. [6]



Total No. of Questions :8]

SEAT No. :

P4527

[4860] - 609

[Total No. of Pages :1

**M.E. (Civil) (Water Resource & Environmental Engg.)**  
**b - ADVANCED WATER TREATMENT & WATER SUPPLY**  
**ENGINEERING**  
**(2012 Pattern) (Semester - I) (Elective-II) (501605)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from section-I & section-II.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** Explain in detail the principle and working of reverse osmosis and micro filtration for water treatment. [16]
- Q2)** Discuss the principle, concept and necessity of aeration. Explain various methods of aeration with neat sketches. [16]
- Q3)** Explain in detail the principle, working and types of grit chambers. Discuss the process for disposal of grit. [16]
- Q4)** Design an aerated grit chamber for the treatment of municipal wastewater. The average flow rate is  $0.5 \text{ m}^3/\text{s}$ . Take peak factor as 2.75. [18]

**SECTION-II**

- Q5)** Explain construction and working process for dual media filters with a neat sketch. Explain backwashing of RSGF. [16]
- Q6)** Define Adsorption processes. State the factors influencing adsorption. Discuss different types of GAC contactors with sketches. [16]
- Q7)** a) What is the theory of disinfection? State the factors affecting disinfection. Discuss the chemistry of chlorination. [8]
- b) Briefly discuss ion exchange materials and typical ion exchange reactions. [8]
- Q8)** Design a RSGF unit for treating 4 MLD of supply, with under drainage system and wash water troughs. [18]

**x x x**

Total No. of Questions :10]

SEAT No. :

**P4466**

**[4860]-61**

[Total No. of Pages :2

**M.E. (Civil - Environmental Engg.)**

**c-ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT**

**(2008 Course) (Semester - I) (Elective-I)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from section I and section II.*
- 2) Each question carries equal marks.*
- 3) Figures to the right indicate full marks.*
- 4) Your answers will be valued as a whole.*
- 5) Assume suitable data, if necessary.*

**SECTION -I**

**Q1)** Explain in details any three from following:

- a) Baseline Study
- b) Mitigation
- c) Matrices
- d) Evaluation of EIA

**Q2)** a) How background information is useful in impact assessment?

- b) Discuss in detail selection of EIA process.

**Q3)** Discuss the followings:

- a) Prediction and assessment of Air Quality.
- b) Water Quality standards.

**P.T.O.**

- Q4)** a) Discuss about basic information during soil quality assessment.
- b) How you will identify the impacts on water bodies during assessment.

**Q5)** Explain step by step assessment procedure for noise and its impacts.

### **SECTION -II**

- Q6)** a) Explain in detail quality assessment of surface water.
- b) How the ground water quality assess, give ground water quality standards.

**Q7)** Explain in brief with suitable example about

- a) Cultural Resources
- b) Socioeconomic Environment.
- c) Resettlement and rehabilitation.

- Q8)** a) What is the role of ministry of Environment and Forest in EIA Process. Discuss in brief.
- b) Explain the relation between categorization of industries and environmental clearance? Explain.

**Q9)** Discuss the following:

- a) EIA Notification.
- b) Categorization of Industries.

**Q10)** With suitable example what is Environmental Management Plan (EMP).



Total No. of Questions : 8]

SEAT No. :

**P4228**

**[4860]-610**

[Total No. of Pages : 2

**M.E. (Civil) (WREE)**

**C - REMOTE SENSING AND GEOGRAPHICAL INFORMATION  
SYSTEM FOR WATER RESOURCES MANAGEMENT  
(Elective - II) (Semester - I) (501605) (2012 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*
- 6) *All questions are compulsory.*

**SECTION - I**

- Q1)** a) Write an essay on Fundamentals of Remote Sensing System. [5]  
b) Discuss the principles of photogrammetry and its applications in water resources. [5]  
c) Write a note on Electromagnetic Spectrum. [3]
- Q2)** a) Discuss in detail the interaction of EMR with 'Atmosphere'. [4]  
b) State and explain the Displacement Law. [4]  
c) Describe the stages of Remote Sensing with neat sketch. [3]
- Q3)** a) Discuss the important advantages of vertical and oblique aerial photographs. [3]  
b) State the elements of image interpretation in short. [5]  
c) What are FCC images? Write its advantages. [5]
- Q4)** a) Discuss various characters of IR images. [3]  
b) Discuss the ORTHO rectification method. [5]  
c) Write a note on Concept of Analog and Digital System. [5]

**P.T.O**

**SECTION - II**

- Q5)** a) Write in brief the Components of GIS. [5]  
b) Describe in brief Geographical Information System (GIS) [5]  
c) Discuss in short buffering. [3]
- Q6)** a) Write a note on Raster Data Structure. [4]  
b) What are Map Projections? [4]  
c) Describe Supervised and unsupervised classification. [3]
- Q7)** a) Describe Spatial and Attribute Database. [3]  
b) Discuss Errors in GIS. [5]  
c) Write an essay on Data collection and input processing in G.I.S [5]
- Q8)** a) Explain RS application in Open Canal Conduit with flow chart. [3]  
b) Write in short the software's used in GIS for water Resources. [5]  
c) Explain in brief 'DEM'. [5]



Total No. of Questions :12]

SEAT No. :

**P4528**

**[4860] - 611**

[Total No. of Pages :3

**M.E. (Civil) (WREE)**

**d-PLANNING AND MANAGEMENT OF WATER RESOURCES  
(2012 Course) (Semester-I) (Elective-II) (501605)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Figures to the right indicate full marks.*
- 2) *Draw neat sketches wherever necessary .*
- 3) *Assume suitable data, if necessary.*
- 4) *Use of calculators allowed.*
- 5) *All questions are compulsory.*
- 6) *Answers to the two sections must be written separately.*

**SECTION-I**

- Q1) a)** What are the strategic goals and objectives of planning and management of water resources and Explain how its performance is measured. **[8]**
- b) How does society gets benefited directly or indirectly due to planning and management of water resources. **[10]**

OR

- Q2) a)** How does integrated water resource management (IWRM) play important role in managing water resources for developing country like INDIA. **[10]**
- b) What are needs and opportunities in planning and management of water resources? **[8]**

- Q3) a)** Comment on spatial and temporal characteristics of water resources. How does it affect management of water resources in our country. **[8]**
- b) Comment on constraints like non-reversibility and planning region and horizon. for water resources development. **[8]**

OR

- Q4) a)** Why is statewide water resources planning of water resources needed? **[8]**

***P.T.O.***

- b) How does state legislation and data gathering play important role in water resources management? [8]

**Q5) a)** Explain various methods of apportionment of total cost of a multipurpose reservoir. [8]

- b) Explain how financial analysis of water resources projects play important role in management of water resources. [8]

OR

**Q6)** A multipurpose project has total cost of 240 million rupees. For the data given below, calculate the allocations to each project purpose, by the following methods. [16]

- a) Remaining benefits method,  
b) Alternative justifiable expenditure method.

Item	Flood control	Power generation	Irrigation
Separable cost	Rs 32 million	Rs 88 million	Rs 72 million
Estimated benefits	Rs 40 million	Rs 138 million	Rs 112 million
Alternate single purpose cost	Rs 47 million	Rs 104 million	Rs 101 million

**SECTION-II**

**Q7) a)** How reservoir sedimentation measured. What are methods to control sedimentation? What are the methods of removing sediments from the reservoir? [10]

- b) What are the characteristics and functions of reservoir? State conflict among uses of reservoir water. [8]

OR

**Q8) a)** In a lift irrigation project a choice is to be made between two pumps, with details given in the following table. Which of these two pumps is economically superior At an interest rate of 8%? Use present Worth Method and take period of analysis as 30 years. [8]



Pump	Capital Cost	Annual Cost	Annual Benifit	Life	Salvage Value
(1)	(2)	(3)	(4)	(5)	(6)
A	40,000	6,000	15,000	10	6,000
B	60,000	5,000	16,000	15	8,000

- b) How do you carry out reservoir operation studies? Explain the effect on river regime. [10]

- Q9)** a) What are effects of other users, other waater bodies and environment on the aquifer. [8]  
b) Explain Jacob's method for unsteady flow towards well. [8]

OR

- Q10)**a) Explain in detail how the conjunctive use of surface and ground water affects on the planning and management of water resources. [8]  
b) Enlist methods to improve the Ground water content to develop the ground water resources in Maharashtra state. [8]

- Q11)**a) Explain discounting techniques. [8]  
b) What are the basic steps in the benefit-cost analysis process and how measuring costs and benefits is carried out. [8]

OR

- Q12)**a) What are the limitations of benefit-cost analysis. [8]  
b) What is 'Inter Basin Water Transfer', enumerate it with suitable example. What is the importance of inter basin water transfer in managing floods and water challenges in drought prone areas. [8]

**x x x**

Total No. of Questions :8]

SEAT No. :

**P4229**

**[4860]-612**

[Total No. of Pages :4

**M.E. (Civil) (Water Resources and Environmental Engg.)**

**OPTIMIZATION TECHNIQUES**

**(2012 Course) (Semester - II) (501608)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

**SECTION-I**

**Q1) a) Solve graphically. [12]**

$$Z_{\max} = 2X_1 + 3X_2$$

$$\text{Subject to } X_1 + X_2 \leq 30$$

$$X_2 \geq 3$$

$$0 \leq X_2 \leq 12$$

$$0 \leq X_1 \leq 20$$

$$X_1 - X_2 \geq 0$$

b) Write the applications of optimization techniques to water resource engineering. [6]

**Q2) a) Show the following cases by graphical means and explain. [8]**

- i) Unique solution
- ii) Infinite solution
- iii) Unbalanced solution
- iv) No solution

**P.T.O.**

- b) Solve the following LP problems by the revised simplex method. [8]

$$\text{Minimize } f = x_1 - 3x_2 + 2x_3$$

$$\text{Subject to } 3x_1 - 3x_2 + 2x_3 \geq 7$$

$$-2x_1 - 4x_2 \leq 12$$

$$-4x_1 + 3x_2 + 8x_3 \leq 10$$

$$x_i \geq 0, i = 1 \text{ to } 3$$

- Q3) a)** Determine the maximum and minimum values of the function; [8]

$$F(x) = 12x^5 - 45x^4 + 40x^3 + 5$$

- b) Define Saddle Point and its Significance. [8]

- Q4) a)** What is the difference between Fibonacci & Golden Section Method. [8]

- b) Find the minimum of  $f = x(x - 1.5)$  in the interval  $(0, 1)$  to within 10% of the exact value. [8]

### SECTION-II

- Q5) a)** What is dynamic programming? How it is different from linear programming? Also state the Bellman's Principle of optimality. [6]

- b) A salesman located in city A decided to travel to city B. he knew the distances of alternative routes from city A to city B, the city of origin A, is city1 and the destination city B is city 10. Other cities through which the salesman will have to pass are numbered 2 to 9. Then find the shortest route. [10]

Node	Distances	Node	Distances	Node	Distances
1-2	8	3-7	4	6-9	4
1-3	7	4-5	3	7-8	3
1-4	10	4-6	5	7-9	5
2-5	4	4-7	4	8-10	4
2-6	6	5-8	7	9-10	6
2-7	8	5-9	6		
3-6	10	6-8	5		

- Q6) a)** Determine the optimal sequence needed to process Job -1 and 2 on five machines A, B, C, D & E. For each machine find the job which should be done first. Also calculate the total time needed to complete both the jobs. **[12]**

Job-1	Sequence :	A	B	C	D	E
	Time (Hrs):	1	2	3	5	1
Job-2	Sequence :	C	A	D	E	B
	Time (Hrs);	3	4	2	1	5

- b) State advantages and limitations of simulation technique. **[6]**

- Q7) a)** Discuss the fields of application for queuing theory. Explain queue discipline and its various forms. **[6]**

- b) A sample of 100 arrivals of automobiles at toll booth is found to be according to the following distribution; **[10]**

Time	0.	1.	1.	2.	2.	3.	3.	4.	4.	5.
between	5	0	5	0	5	0	5	0	5	0
arrivals in Min										
Frequency	2	6	10	24	20	15	10	7	4	2

The time taken for service follows the distribution.

Service Time in Min.	0.5	1.0	1.5	2.0	2.5
Frequency	13	22	37	20	8

Estimate the average % waiting time and idle time of a customer by simulation for next 10 arrivals. Use the following random numbers.

Arrivals:	16	77	23	02	77	28	06	24	25	93
Service:	56	65	05	61	86	90	92	10	79	80

- Q8)** a) Explain Two Person Zero Sum Game. Distinguish between pure strategy & mixed strategy. [8]
- b) Reduce the following game by dominance and find the game value. [8]

		Player B			
		Strategies	I	II	III
Player A	I	20	15	12	35
	II	25	14	8	10
	III	40	2	10	5
	IV	-5	4	11	0

*EEE*

Total No. of Questions : 8]

SEAT No. :

**P4529**

**[4860] - 613**

[Total No. of Pages : 3

**M.E. (Civil) (Water resources and Environmental Engineering)**

**OPEN CHANNEL HYDRAULICS**

**(2012 Course) (501609) (Semester-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of logarithms tables, slide rule, Mollier charts, electronic pocket calculator is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION-I**

- Q1)** a) A discharge of 20 m<sup>3</sup>/s flows in a rectangular channel 10 m wide set to a slope of 10<sup>-4</sup>. Find the normal depth of flow if n=0.012 [8]
- b) Define conveyance, second hydraulic exponent, normal depth, critical depth in relation with open channel flow. [8]
- Q2)** a) Write in detail about control of jump by abrupt rise in bed. [8]
- b) Derive relation between conjugate depths for a sloping channel. [8]
- Q3)** a) Integrate the dynamic equation of GVF by Chow's method and derive equation for distance between two sections across a profile. [8]
- b) Explain M<sub>2</sub>, S<sub>1</sub> and A<sub>2</sub> profile with a neat sketch. [8]

**P.T.O.**

**Q4)** Write short notes on (any three) **[18]**

- a) Assumptions involved in the analysis of GVF.
- b) Characteristics of hydraulic jump on sloping floor.
- c) Relation between Manning's 'n' and Chezy's C.
- d) Velocity distribution in open channel.

**SECTION-II**

**Q5) a)** What is spatially varied flow? Explain its different types with sketches. State the assumptions made for deriving the dynamic equation for spatially varied flow. **[8]**

b) Derive De-Marchi equation for side weirs. **[8]**

**Q6) a)** Explain method of characteristics for flood routing. **[6]**

b) Route the following flood through a reach for which  $K=12$  h and  $x=0.2$ . At  $t=0$  the outflow discharge is  $10 \text{ m}^3/\text{s}$ . Use Muskingum method **[12]**

Time(h)	0	6	12	18	24	30	36	42	48	54
Inflow( $\text{m}^3/\text{s}$ )	10	20	50	60	55	45	35	27	20	15

**Q7) a)** Derive dynamic equation of monoclinal rising wave. **[8]**

b) A rectangular channel 3 m wide has a flow of  $3.6 \text{ m}^3/\text{s}$  with a velocity of  $0.8 \text{ m/s}$ . If a sudden release of additional flow at upstream end of the channel causes the depth to rise by 50% determine the absolute velocity of resulting surge and new flow rate. **[8]**

**Q8)** Write short notes on

**[16]**

- a) Assumptions made in deriving equation for spatially varied flow  
Pwith increasing discharge.
- b) Bottom rocks.
- c) Dam break problem.
- d) Solitary wave.

ζ ζ ζ



Total No. of Questions : 8]

SEAT No. :

**P4230**

**[4860]-614**

[Total No. of Pages : 2

**M.E. (Civil - Water Resource and Environmental Engineering)**

**ADVANCED WASTE WATER TREATMENT**

**(2012 Course) (501610)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if necessary clearly mentioning the same.*
- 4) *Use of non - programmable scientific calculator is allowed..*

**SECTION - I**

**Q1) a)** Write the basic principle and function for the grit chamber and primary sedimentation tank. **[10]**

b) Write the five characteristics of wastewater with significance and effluent standards for the same parameters. **[6]**

**Q2) a)** Explain basic mass balance reactions for aerobic and anaerobic process. **[10]**

b) Explain the kinetics of biological growth. **[6]**

**Q3) a)** Write short note on. **[10]**

- i) Grit Chamber
- ii) Disposal of grit material.

b) Design PST 1 MLD . Assume the necessary data. **[8]**

***P.T.O***

- Q4) a)** Explain the factor affecting coagulation and flocculation process. [10]
- b) Explain the factors considered in designing of flow equalization tank.[6]

**SECTION - II**

- Q5) a)** Explain any one modification of activated sludge process. [6]
- b) A two stage trickling filter is designed for an organic loading of 10000 kg of BOD in raw sewage per Ha-m per day. Recirculation ratio is 1.5. The filter treats 30 mld of raw sewage with a BOD of 200mg/l.using NRC equation, determine the strength of the effluent. [10]
- Q6) a)** Explain the objectives of the modification of ASP. [6]
- b) Explain with a neat sketch : working of a two stage digester. Explain empirical formulae used to find the volume of the two stage digester.[10]
- Q7) a)** Write short note on [10]
- i) Reverse osmosis.
- ii) Desalination.
- b) Explain the theory of adsorption with any example. [6]
- Q8) a)** Explain any two methods for the removal of dissolved solids. [10]
- b) Compare ASP and TF. [8]



Total No. of Questions : 8]

SEAT No. :

**P4231**

**[4860]-616**

[Total No. of Pages : 2

**M.E. CIVIL (Water Resource and Environmental Engg.)  
b - NOISE POLLUTION AND CONTROL TECHNIQUE  
(Elective - III) (2012 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in a separate answer books.*
- 2) Attempt three Questions from each section.*
- 3) Figures to the right indicates full marks.*
- 4) Neat diagrams must be drawn wherever necessary.*

**SECTION - I**

**Q1)** Draw neat sketch and discuss sound propagation characteristics. Also state how sound is absorbed in air. **[16]**

**Q2)** Draw a neat sketch of Human ear showing its main parts and explain Hearing mechanism. Also discuss the concept of Sleep disturbance. **[16]**

**Q3)** Enlist various instruments for measurement of noise and explain in brief any two techniques for measurement of noise. Also state various sources of noise. **[16]**

**Q4)** Write note on : **[18]**

- a) Sound/noise signal and its power spectrum.
- b) Protective equipment's and basic principles of noise control.
- c) Noise in Home and its control.

**SECTION - II**

**Q5) a)** What is noise labeling ? Also discuss how noise diagnostics studies are carried out ? **[8]**

**b)** Enlist sources of Noise pollution due to civil Engineering constructions and give remedial measures to reduce the noise pollution. **[8]**

**P.T.O**

- Q6)** a) Discuss the effect of noise on task performance and cardio-vascular system. [8]
- b) Compares Noise Induced Hearing Loss (NIHL) and Noise Induced Temporary Threshold Shift (NITTS) [8]
- Q7)** Explain in detail traffic noise ? Also discuss any one case study of traffic noise due to various vehicles. [16]
- Q8)** Write note on [18]
- a) Noise from Industry and its control.
- b) Air craft and Airport noise any one case study.
- c) Legal provisions in India to avoid noise pollution.



Total No. of Questions :8]

SEAT No. :

**P4232**

**[4860]-617**

[Total No. of Pages :2

**M.E. (Civil)**

**WATER RESOURCE AND ENVIRONMENTAL ENGINEERING**

**c - Ground Water Modelling**

**(2012 Pattern) (Semester - II) (Elective -III) (501611)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate books.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of calculator is allowed.*
- 5) Assume suitable data, if necessary.*
- 6) All questions are compulsory.*

**SECTION-I**

- Q1) a)** Write in detail the occurrence and movement of groundwater. **[10]**
- b) Discuss in short the aquifer system. **[5]**
- Q2) a)** Write a note on Unit Hydrograph and explain the different components consider during the calculation of Unit Hydrograph. **[10]**
- b) Discuss in short the Darcy's law. **[5]**
- Q3) a)** Write an essay on seepage from surface water artificial recharge. **[5]**
- b) Vertical distribution of sub surface water. **[5]**
- Q4) a)** Write in short the Ground water budget. **[5]**
- b) How Pump tests are carried on field. **[5]**

**P.T.O.**

## SECTION-II

- Q5)** a) Write in detail the limitations of groundwater development in deccan trap. [10]  
b) Limitations in ground water flow modeling. [5]
- Q6)** a) Discuss confined and unconfined aquifier, helping for ground water modeling. [10]  
b) Limitations of ground water modeling by FEM. [5]
- Q7)** a) Discuss in detail the Mathematical modeling of ground water system. [5]  
b) Sources of error in Modeling. [5]
- Q8)** a) Discuss the details of misuse of Models for ground water modeling. [5]  
b) Write a note on data preparation for the ground water modeling. [5]

*EEE*

Total No. of Questions :10]

SEAT No. :

**P4233**

**[4860]-617-A**

[Total No. of Pages :4

**M.E. (Civil) (Water Resources and Environmental Engineering)**

**INDUSTRIAL WASTE MANAGEMENT**

**(2012 Course) (Semester - II) (Elective -III) (501611)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Attempt any three questions from each sections.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*
- 7) *Use data sheet.*

**SECTION-I**

**Q1) a)** Explain physical, chemical & biological characteristics of industrial waste water. **[8]**

b) The cumulative flow of waste water (W.W.) reaching to CETP in a day varies as shown in table No.1 Determine the capacity of equalization tank for given flow variations. Plot graph of time Vs Cumulative flow.**[8]**

Table No.1 Data for finding capacity of equalization tank

Time Hr.	0	2	4	6	8	10	12	14	16	18	20	22	24
Cumulative flow m <sup>3</sup>	0	25	50	75	100	110	130	140	150	165	170	198	220

**Q2) a)** Explain grab and composite sampling technique. **[8]**

b) Explain techniques for reduction of waste. **[8]**

**P.T.O.**

**Q3) a)** Plot the BOD curve and calculate  $K_t$  &  $L_t$  for the following data. [8]

Time days	2	4	6	8	10
BOD mg/L	10	20	23	25	30

b) Explain the concept of self purification of stream. [8]

**Q4) a)** Explain different methods for removal of TDS. [8]

b) Design an aerobic sludge digester for Industrial waste water of 10 MLD, quantity of sludge produced = 2000 kg/d, Sp. Gravity = 1.003, Solid concentration = 3.5%, HRT = 15 days, Volatile solids = 80% Find: [8]

i) Volume of sludge digested per day.

ii) Volume of sludge digester.

iii) Oxygen required take oxygen requirement as 2 kg/kg-d of volatile solid cell oxidized and 40% cell destroyed.

iv) Volume of air supplied  $1.20 \times 0.21 \text{ kg/m}^3$ .

**Q5) a)** The BOD of industrial W.W. for 1 day at 30°C has been found to be 110 mg/L. What will be the 5 day BOD at 20°C. Take  $K_D(20^\circ\text{C}) = 0.1$ . [9]

b) Explain the concept of anaerobic sludge digestion with three phases such as hydrolysis, acidogenesis, methanogenesis and also explain conventional sludge digester with diagram. [9]

## SECTION-II

**Q6) a)** The treated W.W. with flow of 2000 L/min is to be treated with PAC to reduced concentration of total organic nitrogen from 5 mg/L to 1 mg/L. The removal follows Freundlich adsorption isotherm in which capacity factor and intensity parameter are  $160 \text{ mg/gm (L/mg)}^{1/n}$  & 0.5 respectively. Determine PAC dose, PAC requirement and annual cost of PAC. Assume PAC cost to be Rs. 50/- per kg. [8]

b) Explain operation and maintenance problem of CETP. [8]



- Q7) a)** Draw a flow diagram for treating W.W. of dairy industry & show all treatment unit. [8]
- b) Draw a flow diagram for treating W.W. of textile industry and show all treatment unit. [8]
- Q8) a)** Explain the electro dialysis process and determine power required for electro dialysis process for the following data: [8]
- i)  $Q = 4000 \text{ m}^3/\text{d}$ ,
  - ii)  $\text{TDS} = 2000 \text{ mg/L}$ ,
  - iii)  $\text{No. of Cells} = 300$
  - iv)  $\text{Cation and anions concentration} = 0.011 \text{ Eq/L}$ ,
  - v)  $\text{Salt removal Efficiency} = 50\%$ ,  $\text{Current efficiency} = 90\%$ .,  $R = 50 \text{ ohm}$ . Use data sheet if required.
- b) Explain importance of treatability index in waste water treatment. [8]
- Q9) a)** Explain the characteristics of sugar industrial waste with value and state disposal method of industrial treated waste with flow diagram. [8]
- b) Write short note on water pollution act 1978. [8]
- Q10)a)** Design CETP for following data [9]
- i)  $Q = 150 \text{ m}^3/\text{d}$ ,
  - ii)  $\text{pH} = 11 - 12$ ,
  - iii)  $\text{BOD at } 27^\circ\text{C} = 70 \text{ mg/L}$
  - iv)  $\text{TDS} = 3000 \text{ mg/L}$
  - v)  $\text{TS} = 6000 \text{ mg/L}$
  - vi)  $\text{Iron concentration} = 700 \text{ mg/L}$
  - vii)  $\text{COD} = 5000 \text{ mg/L at } 27^\circ\text{C}$

Find:

- 1) Volume of sedimentation tank
  - 2) Acid required for neutralization if 3 lit acid required for 1 m<sup>3</sup>/d of E/F pH.
  - 3) Quantity of time required for removal of Iron take lime consumption as 1mg/L of Iron required 0.5 mg/L of lime.
  - 4) Select suitable method for removal of COD and BOD.
  - 5) F/M ratio
- b) Write short note on hazardous waste management. [9]

*EEE*

Total No. of Questions :12]

SEAT No. :

P4234

[4860]-618

[Total No. of Pages :4

**M.E. (Civil) (Water Resource and Environmental Engineering)**  
**DAM ENGINEERING**

**(2012 Pattern) (Semester - II) (Elective -IV) (501612)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section - I.*
- 2) *Solve Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section - II.*
- 3) *Answer any 3 questions from each section.*
- 4) *Answers to the two sections should be written in separate books.*
- 5) *Neat diagrams must be drawn wherever necessary.*
- 6) *Figures to the right indicate full marks.*
- 7) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 8) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1) a)** Calculate the maximum and minimum normal stress intensities at the base of the dam section shown in fig-1 when the reservoir is
- i) empty and
  - ii) full.

Neglect earthquake effect. Also calculate sliding factor and shear friction factor of safety. Assume shear strength 35 kg/sq. cm, coefficient of friction  $\mu$  as 0.75 and weight of concrete 2400 kg/m<sup>3</sup>. **[10]**

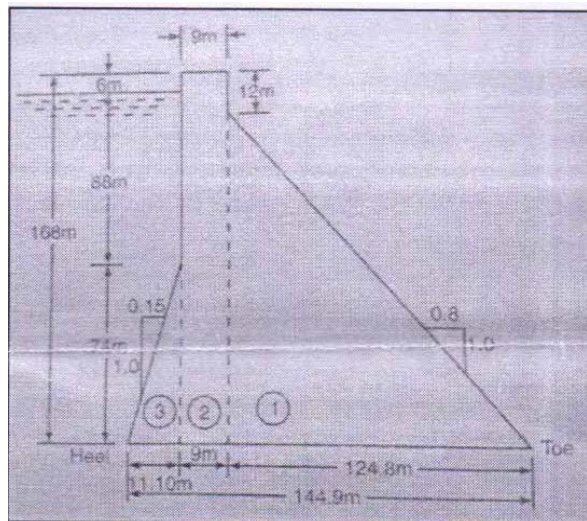


Fig-1

**P.T.O.**

- b) What is an elementary profile of a gravity dam? Explain how it is different from practical profile. [4]
- c) Write short note on construction and contraction joints in gravity dam. [4]

OR

- Q2)** a) Write short note on earthquake pressure in gravity dams. Explain in detail effect of horizontal and vertical acceleration. [8]
- b) Mention the various forces acting on a gravity dam. How are they determined? [6]
- c) What are the different methods of stability analysis of gravity dam? Explain analytical method in detail. [4]
- Q3)** a) What are salient features of an arch dam and different types of arch dam? Derive an equation for best central angle of arch dam. [10]
- b) Explain the design criteria for arch dam. [6]

OR

- Q4)** a) What are the different methods of design of an arch dam? Explain thin cylinder theory in detail. [10]
- b) What are the limitations of thin cylinder theory? [6]
- Q5)** a) Draw a typical section of an earth dam and explain the functions performed by each component. [8]
- b) A homogeneous earth dam has a section as shown in fig -2. It is provided with a horizontal filter 20 m long on the D/S side. Draw the base parabola and indicate the adjustments required to obtain phreatic line from it. [8]

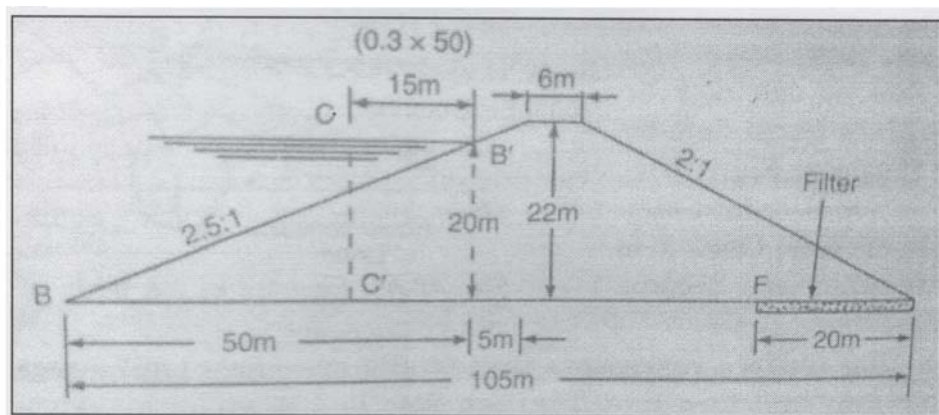


Fig-2

OR

- Q6) a)** Calculate the seepage per meter length through the body of the dam section shown in fig-3. Assume coefficient of permeability  $K = 8 \times 10^{-4}$  cm/sec. **[8]**

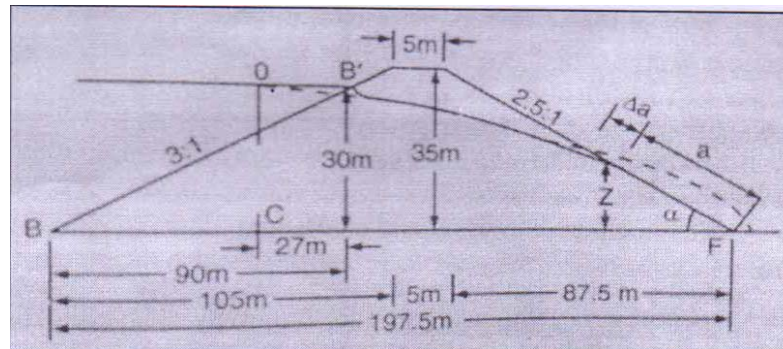


Fig-3

- b) Draw sketches of earth dam cross-sections for the following three cases, when both pervious and impervious materials are available in the field. **[8]**
- i) Impervious foundation to a large depth.
  - ii) Pervious foundation to some depth and then impervious material downwards.
  - iii) Pervious foundation to a large depth.

## SECTION-II

- Q7) a)** Explain the various types of rockfill dams and draw the sketches for each of them. **[10]**
- b) What are the various methods of construction of rockfill dams? Explain any one in detail. **[8]**

OR

- Q8) a)** Explain the concept and design of Buttress dam. Also discuss the merits and demerits of buttress dam over gravity dam. **[10]**
- b) Draw plan and an elevation of a flat slab deck type buttress dam and describe the important features of the same. **[8]**

- Q9) a)** Design an Ogee shape gated spillway for the following data: [10]
- i) Maximum design flood = 1200 cumec.
  - ii) Average river bed level = 0 m.
  - iii) R.L. of crest of spillway = 101.00 m.
  - iv) Slope of crest of spillway = 0.7H : 1V.
  - v) Width of pier = 2.0 m.
  - vi) Maximum allowable water level during flood = 105.00 m.
- Assume number of span as 7, clear way of each span as 10.0m and  $k_a = 0.1$ ,  $K_p = 0.01$ .
- b) Explain energy dissipation arrangement for the following two cases: [6]
- i) T.W.C. coincides H.J.C.
  - ii) T.W.C. always above H.J.C.

OR

- Q10)a)** Describe Indian Standard practice for design of horizontal apron stilling basin for a dam spillway. [8]
- b) Describe the Creager's method of designing profile of a overflow spillway. [8]
- Q11)a)** Explain with neat sketches: [8]
- i) Remiolds automatic gate
  - ii) Visvesvaraiya's gate
- b) What are the advantages of gated spillway. [8]

OR

- Q12)a)** Explain with neat sketches: [8]
- i) Drum gate
  - ii) Stoney gate
- b) What are sluices? What functions they serve? Describe Dharwar and Belgam type briefly with the help of sketches. [8]

EEE

Total No. of Questions : 8]

SEAT No. :

P3985

[Total No. of Pages : 2

[4860] - 62

**M.E. (Civil) (Environmental Engineering)**

**OCCUPATIONAL SAFETY & HEALTH**

**(2008 Pattern) (Elective - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**Section - I**

- Q1)** a) Comment in detail on occupational safety and health administration. [8]  
b) What are the OSHAS 18001 Health & Safety Standards? [8]
- Q2)** a) What are the measures for preventing ergonomics hazards? Explain. [8]  
b) Explain hazard analysis with example of dying industry. [8]
- Q3)** a) Explain Task Analysis in Ergonomics. [8]  
b) How to control hazards in Sugar industry? [8]

***P.T.O.***

- Q4)** Write short notes on following. [18]
- a) Human error analysis.
  - b) Right to know laws.
  - c) Needs of ergonomics.

**Section - II**

- Q5)** a) Comment on occupational health and safety measures in industry. [8]  
b) Discuss the ill effects of fire in an industry & suggest methods of extinguishing the fire. [8]
- Q6)** a) What are the electrical safety measures in an industry? Explain. [8]  
b) Explain fire development and its severity. [8]
- Q7)** a) Write about possible of fall on construction site. Comment on safety to prevent scaffolding collapse. [8]  
b) How to tackle health problems in pharmaceutical industry? Explain. [8]
- Q8)** Write short notes on the following : [18]
- a) Types of fires.
  - b) Personal Protective Equipments for safety on site.
  - c) Models to control accidents.





Total No. of Questions : 12]

SEAT No. :

**P4530**

**[4860] - 620**

[Total No. of Pages : 3

**M.E. (Civil) (WREE)**

**c - CLOSED CONDUIT FLOW**

**(2012 Course) (Semester - II) (501612) (Elective - IV)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Figures to the right indicate full marks.*
- 2) *Draw neat sketches wherever necessary.*
- 3) *Assume suitable data if necessary.*
- 4) *Use of calculators allowed.*
- 5) *All questions are compulsory.*
- 6) *Answers to the two sections must be written separately.*

**SECTION - I**

- Q1) a)** Derive expressions for water hammer in elastic pipe. How does it vary for rigid pipe. **[8]**
- b) A centrifugal pump works at 100 rpm, vane angle at outlet is  $60^\circ$ . Velocity of flow 3m/s is constant. Impeller diameter at exit is twice that at inlet. Monometric head and monometric efficiency are 30m and 70 percent respectively. Find: **[10]**
- i) diameter of impeller at exit, and
  - ii) Vane angle at inlet.

OR

- Q2) a)** What do you understand by static head Manometric head and total head of a centrifugal pump? Explain Manometric, Mechanical and overall efficiencies of centrifugal pumps. **[9]**
- b) Derive the expression for specific speed of centrifugal pump. **[9]**

**P.T.O.**

- Q3)** a) Explain Water hammer theory (elastic and rigid) for pipeline flow for hydroelectric project. [8]
- b) Illustrate with the help of sketch variation in hydraulic gradient in a penstock with change of load. [8]

OR

- Q4)** a) What do you understand by a surge tank? Illustrate with sketches its different types. [8]
- b) Do we need surge tanks in tailrace tunnel? Illustrate various types with suitable sketches. [8]

- Q5)** a) A penstock 2000m long and  $m$  in diameter has a surge tank 20m diameter for a discharge of 30 cumecs. Friction factor is 0.018. Normal reservoir level is 500m. Determine maximum and minimum water levels in the tank. [8]
- b) Determine the pressure rise through water flowing elastic pipe 5 km long of 2m diameter, velocity of water 3m/s is suddenly stopped by a valve at turbine end. Assume  $\rho = 102\text{kg/m}^3$ ,  $E = 2.1 \times 10^6 \text{ kg/cm}^2$  and  $K = 21000 \text{ kg/cm}^2$ . Pipe thickness is 10mm. Also find the length of the pipe subjected to peak pressure. [8]

OR

- Q6)** a) What are the functions of surge tanks? Determine the pressure rise due to sudden closure of the valve at the end of steel penstock pipe 500m long carrying water at a velocity of 5m/s. Assume  $\sigma = 102$ . [8]
- b) Explain in detail differential surge tanks with expanded chambers. [8]

### SECTION - II

- Q7)** a) What are various components of water distribution system? Explain with sketches. [8]
- b) Explain in detail method of pipe network analysis. [10]

OR

- Q8)** a) Explain use of PIPE2000(KYPIPE) for design of pipeline. [9]  
b) Explain in detail contribution of computer science in planning and management of water supply. [9]

- Q9)** a) Explain use of SURGE program. [8]  
b) State basic equations of transient flow analysis in closed conduits and explain terms involved. [8]

OR

- Q10)**a) Explain use of HEC RAS(HEC2) program in managing water resources. [8]  
b) Explain use of Pipe2000-SWMM program. [8]

- Q11)**a) Explain classification of open channel flows. [8]  
b) What are gradually varied flows explain with sketches various GVF profiles. [8]

OR

- Q12)**a) What are rapidly varied flows (RVF) explain with sketches RVF. [8]  
b) Explain use of floodplain hydraulics in design of various civil engineering structures. [8]



Total No. of Questions : 8]

SEAT No. :

**P4679**

[Total No. of Pages :2

**[4860]-621**

**M.E. (Water Resource & Environmental Engg.)  
Research Methodology and Intellectual Property Rights  
(2012 Pattern)**

*Time : 3 Hours]*

*[Maximum Marks : 100*

*Instructions to the candidates:*

- 1) *Attempt any three questions from each section.*
- 2) *Figures to right indicate full marks.*

**SECTION - I**

- Q1)** a) State and explain the various steps of research process. [8]  
b) What is a research design? Explain the objectives of research. Also distinguish between historical and experimental research Write a note on 'Basic principles of experimental designs' [9]
- Q2)** a) Describe in brief the four operations of data processing. [8]  
b) Enlist the various data collection methods and discuss the factors affecting their choice. [9]
- Q3)** a) Which are the statistical measures used for data analysis. Describe their significance. [8]  
b) What is ANOVA (analysis of variance) test ? In which situation is it useful? [8]
- Q4)** a) What is multiple regression analysis ? When is it used? [8]  
b) State and describe various decision making techniques. [8]

**SECTION - II**

- Q5)** a) How can we use genetic algorithm for decision making? [8]  
b) Explain various steps involved in report writing. [9]

**P.T.O.**

- Q6)** a) State and explain various techniques of interpretation. [8]  
b) What is patenting? How are the patents useful to society, business, and individuals? [9]
- Q7)** a) Describe the various steps involved in the process of obtaining patent protection? [8]  
b) How can patents be obtained worldwide?. [8]
- Q8)** a) What is the Patent Cooperation Treaty (PCT)? Which are the new developments in IPR? [8]  
b) How are geographical indication rights enforced? What is the difference between a geographical indication and a trademark? [8]



Total No. of Questions : 8]

SEAT No. :

**P4531**

**[4860] - 622**

[Total No. of Pages : 3

**M.E. (Mechanical) (Energy Engg.)**  
**ADVANCED ENGINEERING MATHEMATICS**  
**(Semester - I) (2012 Course)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from Section - I and three questions from Section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1) a)** Find series solution of the differential equation: **[9]**

$$\frac{d^2y}{dx^2} + x^2y = 0$$

b) Show that: **[9]**

i)  $P_n(1) = 1$

ii)  $P_n(-x) = (-1)^n P_n(x)$

**Q2) a)** Use method of Frobenius to find solution of the differential equation. **[8]**

$$x^2 \frac{d^2y}{dx^2} + \frac{dy}{dx} - y = 0$$

b) With usual notation, prove that **[8]**

$$\int J_3(x) dx = -J_2(x) - \frac{2}{x} J_2(x)$$

**P.T.O.**

- Q3)** a) State and prove Rodrigue's formula. [8]  
 b) Find characteristics values and characteristics functions of Sterm-Liouville's problem for  $\lambda > 0$  and real number. [8]  
 $y'' + \lambda y = 0, y(0) = 0, y'(\pi) = 0$

- Q4)** a) Explain D'Alembert method for finding solution of wave equation. [8]

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$$

Subject to:

- i)  $u(x, 0) = f(x)$   
 ii)  $u_t(x, 0) = g(x)$   
 b) A rod of the length  $l$  with insulated sides is initially at a uniform temperature  $u_0$ . Its ends are suddenly cooled to  $0^\circ\text{C}$  and are kept at that temperature. Find the temperature function  $u(x, t)$ . [8]

### SECTION - II

- Q5)** a) Expand the function  $f(x) = x \sin x$  as Fourier series in the interval  $-\pi \leq x \leq \pi$  and hence find: [9]

$$\frac{\pi - 2}{9} = \frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \frac{1}{7.9} + \dots$$

- b) A string is stretched and fastened to two points  $l$  apart. Motion is started by displacing the string in the form  $y = a \sin \frac{\pi x}{l}$  from which it is released at time  $t = 0$ . Show that displacement of any point at a distance  $x$  from one end at time  $t$  is given by  $y(x, t) = a_0 \sin \frac{\pi x}{l} \cdot \cos \frac{\pi ct}{l}$ . [9]

- Q6)** a) Find Fourier Transform of  $e^{-x^2}$ . [8]

- b) Define: [8]

- i) Linear Transform.  
 ii) Singular Transform.

If  $T: \mathbb{R}^3 \rightarrow \mathbb{R}^2$  is defined by  $T(x, y, z) = (x + y + z, 3x + 2y + 1)$

Examine T is linear or not. Justify your answer.

**Q7) a)** Solve the equation  $\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0$  with conditions: **[8]**

- i)  $V = 0$  when  $y \rightarrow +\infty$  for all  $x$ .
- ii)  $V = 0$  when  $x = 0$  for all values of  $y$ .
- iii)  $V = 0$  when  $x = 1$  for all values of  $y$ .
- iv)  $V = x(1 - x)$  when  $y = 0$  for  $0 < x < 1$ .

b) Show that every tensor can be expressed as the sum of a symmetric and skew symmetric tensors in pairs of covariant and contravariant indices. **[8]**

**Q8) a)** Explain with examples: **[8]**

- i) Contravariant tensor.
- ii) Covariant tensor.
- iii) Mixed tensor.

b) Use Fourier transform to solve  $\frac{\partial u}{\partial t} = 2 \frac{\partial^2 u}{\partial x^2}$ ,  $0 < x < \infty$ ,  $t > 0$ . **[8]**

Subject to the following conditions:

- i)  $u(0, t) = 0$ ,  $t > 0$ .
- ii)  $u(x, 0) = e^{-x}$ ,  $x > 0$ .
- iii)  $u$  and  $\frac{\partial u}{\partial x} \rightarrow 0$  as  $x \rightarrow \infty$ .





Total No. of Questions :8]

SEAT No. :

**P4235**

**[4860]-623**

[Total No. of Pages :2

**M.E. (Mechanical-Energy Engineering)**  
**ADVANCED THERMODYNAMICS**  
**(2012 Course) (Semester - I) (502502)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of calculator is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Explain Law of corresponding states. [6]
- b) Discuss the generalised compressibility chart with suitable diagram? [6]
- c) State and explain Vander Waal's Equation of State. [4]
- Q2)** a) Explain the phase change process from solid to gas with P-V, T-S and P-T diagram for a substance which shrinks in volume on melting and also for a substance which expands in volume on melting. [6]
- b) Explain Critical point and triple point of water with sketch. [4]
- c) On Mollier diagram, why do the isobars diverge from one another. [6]
- Q3)** a) Explain increase in entropy principle and entropy generation. [8]
- b) Discuss the law of degradation of energy and availability function of closed and open system. [8]

***P.T.O.***

**Q4)** Write a note on:

- a) Availability and Irreversibility [6]
- b) T-dS relations [6]
- c) Exergy Destruction [6]

### SECTION-II

**Q5) a)** Write a note on Maxwell relations. [8]

b) Derive the relation  $(C_p - C_v) = -T \left( \frac{\partial v}{\partial T} \right)_p^2 \left( \frac{\partial p}{\partial v} \right)_T$  [8]

**Q6) a)** Explain the enthalpy of reaction with suitable example. [6]

b) Find the adiabatic flame temperature for methane-air stoichiometric mixture. Consider Initially reactants are at 1 atm and 298 K. Use following data. [10]

Species	Heat of formation (kJ/kmol)	Specific Heat Cp at 1200 K(kJ/kmol.K)
CH <sub>4</sub>	-74831	--
CO <sub>2</sub>	-393546	56.21
H <sub>2</sub> O	-241845	43.87
N <sub>2</sub>	0	33.71

**Q7) a)** Discuss the Amagat's Law and Kay's rule. [8]

b) As applied to statistical thermodynamics, explain the principle of equipartition of energy. [8]

**Q8)** Write a note on:

- a) The criteria for chemical equilibrium. [6]
- b) Explain Inversion Curve and Joule-Thompson Coefficient. [6]
- c) Clapeyron equation. [6]

*EEE*

Total No. of Questions :8]

SEAT No. :

**P4236**

**[4860]-625**

[Total No. of Pages :2

**M.E. (Mechanical) (Energy Engineering)**  
**NUCLEAR MATERIALS AND REACTOR FUNDAMENTALS**  
**(2012 Course) (Semester - I) (Elective -I)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Answer any three questions from each section.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right side indicate full marks.*
- 5) Use of calculator is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION-I**

- Q1) a)** Describe the processes of transmutation, conversion, and breeding.[9]
- b) Define the following terms: [9]
- i) Fissile material
  - ii) Fissionable material
  - iii) Fertile material
- Q2) a)** Explain the fission process using the liquid drop model of a nucleus.[8]
- b) Define the following terms: [8]
- i) Radioactivity
  - ii) Curie
  - iii) Becquerel

**P.T.O.**

**Q3) a)** A sample of material contains 20 micrograms of californium-252. Californium-252 has a half-life of 2.638 yers. [8]

Calculate:

- i) The number of californium -252 atoms initially present.
  - ii) The activity of the californium-252 in curies
  - iii) The number of californium -252 atoms that will remain in 12 years
  - iv) The time it will take for the activity to reach 0.001 curies
- b) Why uranium-235 fissions with thermal neutrons and uranium-238 fissions only with fast neutrons? Explain in detail. [8]

**Q4) a)** Describe the following reactions where a neutron is absorbed in a nucleus: [8]

- i) Radioactive capture
  - ii) Particle ejection
- b) Explain the effect of radiation damage on nuclear materials. [8]

## SECTION-II

**Q5) a)** Differentiate between Boiling water reactor (BWR) Pressurized heavy water reactor (PWR) with neat sketch. [8]

b) How nuclear fuel rods are manufactured? Explain in detail. [8]

**Q6) a)** Explain various grades of enriched uranium and their applications. [8]

b) Explain the problems and costs involved in nuclear fuel disposal. [8]

**Q7) a)** Define the following terms: [8]

i) Reactor period

ii) Doubling time

b) What is In-situ leaching? Explain in detail. [8]

**Q8) a)** Describe the relationship between the delayed neutron fraction, average delayed neutron fraction, and effective delayed neutron fraction. [9]

b) What is the purpose of control rod and moderator in nuclear reactor? Explain various types of control rods and moderators. [9]



Total No. of Questions :8]

SEAT No. :

**P4467**

**[4860]-63**

[Total No. of Pages :2

**M.E. (Civil - Environmental Engg.)**

**PRINCIPLES AND DESIGN OF BIOLOGICAL TREATMENT SYSTEM**

**(2008 Course) (Semester - I) (Elective - II (B))**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any 3 questions from section I and section II.*
- 2) Each question carries equal marks.*
- 3) Figures to the right indicate full marks.*
- 4) Your answers will be valued as a whole.*
- 5) Assume suitable data, if necessary.*
- 6) Use of electronic pocket calculator and steam table is allowed.*

**SECTION -I**

**Q1)** Discuss Aerobic and Anaerobic treatment kinetics of biological growth in wastewater treatment.

**Q2)** Explain in detail biodegradability assessment.

**Q3)** The following test results were obtained for a wastewater sample taken at the headwork to a wastewater treatment plant. All of the test water performed using a sample size of 50ml. Determine the concentration of total solids, total volatile solids, suspended solids, volatile suspended solids, total dissolved solids and total volatile dissolved solids. The sample used in the solids analysis were all either evaporated, dried, or ignited to constant weight. The results are

- a) Tare mass of evaporating dish = 53.5433 gm
- b) Mass of evaporating dish + residue after evaporation at 105°C = 53.5794 gm
- c) Mass of evaporating dish + residue after ignition at 550°C = 53.5625 gm
- d) Tare mass of filter paper after drying at 105°C = 1.5433 gm
- e) Mass of filter paper and residue after drying at 105°C = 1.5554 gm
- f) Mass of filter paper and residue after ignition at 550°C = 1.5476 gm

**Q4)** Discuss in detail about control of Odour.

**P.T.O.**

## SECTION -II

- Q5)** Explain in detail with suitable sketch about Rotating Biological Contactors process.
- Q6)** What is stabilization pond, how it will helpful in treatment process explain in details.
- Q7)** Discuss with suitable sketch of UASB reactor and explain its working.
- Q8)** How Sludge Management advantageous, explain the facilities made with management system.

*EEE*

Total No. of Questions :8]

SEAT No. :

**P4237**

**[4860]-630**

[Total No. of Pages :2

**M.E. (Mechanical) (Energy Engineering)**  
**NON CONVENTIONAL ENERGY SOURCES**  
**(2012 Pattern) (Semester - I) (502505 C) (Elective -II)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic table, slide rule, mollier charts, electronic pocket calculator and steam table is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION-I**

**Q1) a)** What are the prospects of non conventional energy sources in India.[8]

b) Define the terms: [8]

i) Altitude angle

ii) Latitude angle

iii) Declination angle

iv) Hour angle

**Q2) a)** Enumerate the different types of concentrating type collectors. Describe a collector used in power plant for generation of electrical energy. [8]

b) Why orientation is needed in concentrating type collectors? Describe the different methods of sun tracking? [8]

**P.T.O.**

- Q3)** a) Classify the methods of solar energy storage system. Describe thermal energy storage system. [8]
- b) Describe a non-convective solar pond for solar energy collection and storage. [8]

**Q4)** Write short notes on following: [18]

- a) Maintenance of stable density gradient in a solar pond.
- b) Cylindrical parabolic concentrating collector.
- c) Beam and diffuse radiation.

### SECTION-II

- Q5)** a) What is mean by energy plantation? What are the advantages and disadvantages. [8]
- b) Explain the various ways of using the biomass by minimizing the environmental impact. [8]

- Q6)** a) Describe with a neat sketch the working of wind energy system with main components. [8]
- b) Derive an expression for maximum turbine output. [8]

- Q7)** a) Describe the main types of turbines in brief, which may used for geothermal energy conversion. [8]
- b) What are the possible sources of geothermal pollution? How these are avoided? [8]

**Q8)** Write short notes on following: [18]

- a) Methods of tidal power generation.
- b) Fuel properties of Biogas.
- c) Wind energy storage.





Total No. of Questions :8]

SEAT No. :

**P4238**

**[4860]-631**

[Total No. of Pages :2

**M.E. (Mechanical - Energy Engineering)**

**CONVECTIVE HEAT TRANSFER**

**(2012 Pattern) (Semester - II)(502508)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of calculator is allowed.*

**SECTION-I**

**Q1) a)** The temperature of a gas stream is to be measured by a thermocouple whose junction can be approximated as a 1-mm-diameter sphere. The properties of the junction are  $k = 35 \text{ W/m}^\circ\text{C}$ , density =  $8500 \text{ kg/m}^3$ , and  $C_p = 320 \text{ J/kg }^\circ\text{C}$ , and the convection heat transfer coefficient between the junction and the gas is  $h = 210 \text{ W/m}^2 \text{ }^\circ\text{C}$ . Determine how long it will take for the thermocouple to read 99 percent of the initial temperature difference. **[8]**

b) Using dimensional analysis establish a relation between Nusselt, Prandtl and Grashof numbers. **[8]**

**Q2) a)** Explain methods to find heat transfer coefficient practically in convection. **[10]**

b) Explain Combined Forced and Free Convection mode of heat transfer. **[6]**

**Q3) a)** Derive the differential form of convection continuity equation. **[8]**

b) Explain physical significance of dimensionless terms in convection. **[8]**

**P.T.O.**

**Q4) Write a short note (Any three):** **[18]**

- a) Combined Convection and Radiation in Flows.
- b) Single Phase Forced Convection in Micro-channels.
- c) Gas Flow in Micro-channels.
- d) Physical mechanism of boundary layer development over flat surface and circular tubes.

**SECTION-II**

**Q5) a) Explain in detail flow boiling in vertical tube under forced convection.** **[8]**

b) Explain advantages and applications of micro-channel heat transfer. **[8]**

**Q6) a) A horizontal steam pipe of diameter 20cm runs through a large room and is exposed to air at a temperature of 20°C. The pipe surface temperature is 180°C. Find the flow of heat per meter length of the pipe by convection and radiation. Take emissivity of pipe surface as 0.8, Use correlation.  $Nu = 0.53 (Gr.Pr)^{1/4}$ . Assume approximate value of required data.** **[8]**

b) Derive equation for counter flow heat exchanger using LMTD method. **[8]**

**Q7) a) Explain forced convection Boiling in detail.** **[8]**

b) Explain film-wise drop-wise condensation and their correlations. **[8]**

**Q8) Write a note (Any three):** **[18]**

- a) Atmospheric and Solar radiation.
- b) Pool Boiling Curve.
- c) Micro-channel heat sinks.
- d) Micro Heat Pipes and it's applications.

*EEE*

Total No. of Questions :8]

SEAT No. :

**P4239**

**[4860]-632**

[Total No. of Pages :3

**M.E. (Mechanical) (Energy Engineering)**  
**ENERGY SYSTEMS MODELLING & ANALYSIS**  
**(2012 Pattern) (Semester - II)(502509)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of calculator is allowed.*

**SECTION-I**

- Q1)** a) What is a system? Explain the concept of system and system environment with an example **[6]**
- b) Explain any two types of system study. **[10]**
- Q2)** a) Enlist the types of model and explain any two of them. **[10]**
- b) Explain interaction between models. **[6]**
- Q3)** a) For common heat exchangers, such as the parallel and counter flow heat exchangers, discuss the development of a simple mathematical model to analyze the system. **[8]**
- b) The temperature (T) of a small copper sphere cooling in air is measured as a function of time (t) to yield the following data: **[8]**

t(s)	0.2	0.6	1.0	1.8	2.0	3.0	5.0	6.0	8.0
T(°C)	146.0	129.5	114.8	90.3	85.1	63.0	34.6	25.6	14.1

An exponential decrease in temperature is expected from lumped mass modeling. Obtain a best fit to represent these data.

**P.T.O.**

**Q4)** Write short note (any three): **[18]**

- a) Best fit and exact fit.
- b) Explain the technique of simulation and its advantages and limitations.
- c) Discrete and continuous system.
- d) Necessity of system modeling.

**SECTION-II**

**Q5) a)** Use the Simplex method to find the maximum value of **[12]**

$$z = 3x_1 + 2x_2 + x_3$$

Subject to the constraints

$$4x_1 + x_2 + x_3 = 30$$

$$2x_1 + 3x_2 + x_3 \leq 60$$

$$x_1 + 2x_2 + 3x_3 \leq 40$$

Where  $x_1 \geq 0$ ,  $x_2 \geq 0$ , and  $x_3 \geq 0$ .

- b) Apply the calculus-based optimization technique just given to the minimization of cost C for hot rolling a given amount of metal. This cost is expressed in terms of the mass flow rate m of the material as

$$C = 3.5m^{1.4} + \frac{14.8}{m^{2.2}}$$

where the first term on the right-hand side represents equipment costs, which increase as the flow rate increases, and the second term represents the operating costs, which go down as m increases. **[4]**

**Q6) a)** Explain basic approach of Lagrange multiplier method. **[8]**

- b) What are different search methods? What is importance of search methods in thermal systems? **[8]**

**Q7) a)** Explain exhaustive search technique and write its algorithm to find optimum design. [8]

b) Find the minimum of  $f = x(x - 1.5)$  using Sequential Dichotomous search method in the interval (0.0, 1.00); take  $\delta = 0.001$  and  $n = 6$ . [8]

**Q8) Write a short note (Any Three):** [18]

a) Interval of uncertainty and reduction ratio.

b) Uniform Dichotomous Search technique.

c) Fibonacci search technique.

d) Pinch technology.

*EEE*

Total No. of Questions :8]

SEAT No. :

**P4240**

**[4860]-633**

[Total No. of Pages :2

**M.E. (Mechanical Energy Engineering)**

**ENERGY MANAGEMENT**

**(2012 Course) (Semester - II)(502510)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicates full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) Define Energy management and explain the objectives of the Energy Management System. [8]
- b) Explain the Scope of the Energy Management System. [8]
- Q2)** a) Explain the three phases of Energy Audit in detail. [8]
- b) What do you mean by 'Energy audit'? Discuss types of energy audit briefly. [8]
- Q3)** a) Explain in detail condensate recovery system including flash steam utilization. [8]
- b) What is steam trap? List various types of steam traps. Discuss with neat labeled diagram any thermostatic type steam trap. [8]
- Q4)** Write a short note on (any three): [18]
- a) Instruments used in energy audit.
  - b) Types of steam trappers.
  - c) Types of thermal insulation.
  - d) Energy conservation plan for a dairy.

**P.T.O.**

## SECTION-II

- Q5)** a) What are their benefits? What are different Energy Conservation Opportunities in HVAC System? [8]
- b) How the power factor improvement is done? [8]
- Q6)** a) What are the topping and bottoming cycles of co-generation? Explain with neat sketch. [8]
- b) Explain the waste heat recovery systems used in boiler and explain how efficiency of the plant increases. [8]
- Q7)** a) Explain in detail the management of spent fuel. [8]
- b) Explain Regulations and policy issues of Nuclear waste Management. [8]
- Q8)** Write a short note on (any three): [18]
- a) Heat pipe.
- b) Energy efficient motors.
- c) System Distribution losses.
- d) Recuperators.

*EEE*

Total No. of Questions :8]

SEAT No :

**P4241**

**[4860] - 634**

[Total No. of Pages : 2

**M.E. (Mechanical) (Energy Engineering)**  
**a - RADIATION SAFETY AND SHIELDING**  
**(2012 Course) (Semester-II) (Elective - III)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answers to the two sections should be written in separate answer books.*
- 2) Answer any three questions from each section.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right side indicate full marks.*
- 5) Use of Calculator is allowed.*
- 6) Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) Write note on application areas of radiations. [8]  
b) Explain biological effect of radiation. [8]
- Q2)** a) Write note on disposal of radioactive waste. [6]  
b) What do you understand about ALARA and BAT principle? [4]  
c) What are criteria for selection of shielding material? [6]
- Q3)** a) Write note on environmental impact monitoring for nuclear power. [8]  
b) What precaution should take in a radiation hazard situation? [4]  
c) Explain control methods for non-ionizing radiation. [4]
- Q4)** Write short note on (Any Three) [18]  
a) Bragg curve.  
b) Annual limit on intake dose.  
c) Fukushima Nuclear Disaster.  
d) Irradiation.

**P.T.O.**



## SECTION - II

- Q5)** a) Write a note on contamination and its measurement. [8]  
b) Explain necessity of controlling radiological contamination? [4]  
c) Explain emergency preparedness for nuclear power plant. [4]
- Q6)** a) Write note on the IAEA standards for safety design. [6]  
b) Explain general safety design criteria. [6]  
c) It can be shown that a beam of 1MeV  $\gamma$ -rays having an intensity of  $10^5$   $\gamma$ -rays/cm<sup>2</sup>-sec deposits in tissue approximately  $5 \times 10^{-3}$  erg/g-sec. Calculate the absorb dose rate and dose equivalent rate. [4]
- Q7)** a) Explain different ways to protect against radiation exposure. [6]  
b) Write a note on provisions that are made for safety at nuclear power plant. [6]  
c) Discuss the protection provided to site person against radiation in operational stage and during decommissioning. [4]
- Q8)** Write note on (Any Three): [18]
- a) Dose Equivalent.
  - b) Radiation safety principles at nuclear power plant.
  - c) Standards of Radiation Protection.
  - d) Kerma (K).



Total No. of Questions :8]

SEAT No :

P4242

[4860] - 639

[Total No. of Pages : 2

**M.E. (Mechanical) (Energy Engineering)**  
**PROCESS STORAGE AND DISPOSAL OF NUCLEAR WASTE**  
**(2012 Pattern) (Semester-II) (Elective - IV) (502512C)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain following: [8]  
i) Radioactivity  
ii) Radio Nuclides.  
b) Explain types of Radioactive Waste in detail. [8]
- Q2)** a) What is Nuclear Decay Law? Explain application of this law. [8]  
b) Explain following: [8]  
i) Short-Lived Waste Radio Nuclides.  
ii) Long-Lived Waste Radio Nuclides.
- Q3)** a) Characterize the radioactive waste approaches to nuclear waste management. [8]  
b) How nuclear waste is produced in various process of nuclear fuel cycle? [8]
- Q4)** Write short note on (Any Three) [18]  
a) Sources of Nuclear Waste  
b) Indian scenario of nuclear waste management  
c) Principles of nuclear waste management  
d) Irradiation.

**P.T.O.**

## SECTION - II

- Q5)** a) Explain the following waste treatment techniques: [8]  
i) Vitrification  
ii) Ion-Exchange  
b) Which are the long term nuclear waste disposal methods? Explain any two in detail. [8]
- Q6)** a) Explain various precautions to be taken during storage and transportation of nuclear waste. [8]  
b) Explain effect of nuclear waste on environment. [8]
- Q7)** a) Explain different ways to protect against radiation exposure. [8]  
b) Explain various solid waste treatment techniques. [8]
- Q8)** Write note on (Any Three): [18]  
a) Hazards of illegal dumping of nuclear waste.  
b) Background Radiation.  
c) Standards of Radiation Protection.  
d) Nuclear waste policy act.



Total No. of Questions : 10]

SEAT No. :

**P4243**

**[4860]-641**

[Total No. of Pages : 3

**M.E. (Mechanical) (CADME)  
ADVANCED MACHINE DESIGN  
(2012 Pattern) (Semester-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

**SECTION-I**

- Q1)** a) What is true stress and true strain? Assuming exponential relation for true stress and true strain, derive the expression to estimate time of rupture. **[8]**
- b) Derive the expression for Airy's stress function in rectangular coordinate. **[8]**
- Q2)** a) Explain the maximum elastic strain theory. **[8]**
- b) Explain the Mohr's theory in detail. **[8]**
- Q3)** a) Explain Castigliano's theorems. **[8]**
- b) Explain the concept of energy balance during crack growth? **[8]**
- Q4)** a) Explain the significance of theory of failure. **[8]**
- b) Explain theory of virtual work and energy. **[8]**

**P.T.O.**

- Q5) a)** Write short notes on Octahedral shearing stress theory. [5]
- b) Explain Generalized Hooke's Law. [5]
- c) Determine the strain energy release rate for a double cantilever beam with  $a \gg 2h$  and  $l \gg 2h$  (shown in Fig. 1), where  $P$  is the applied load and  $B$  is the width of the beam. [8]

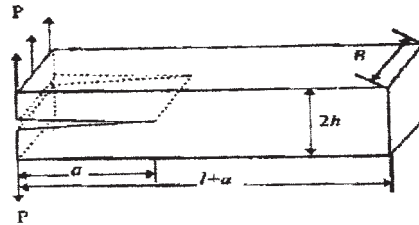


Fig. 1 Double cantilever beam

## SECTION-II

- Q6) a)** Explain in brief the state of strain at a point. [8]

- b) Following creep data at a certain temperature is known.

$$s_1 = 10.5 \text{ MPa} \quad \dot{\epsilon}_1 = 0.012 \text{ percent per 1000 hrs}$$

$$s_2 = 14 \text{ MPa} \quad \dot{\epsilon}_2 = 0.025 \text{ percent per 1000 hrs}$$

Determine the constants of the hyperbolic sine law and calculate the creep rates for stresses 20 MPa and 28 MPa. [8]

- Q7) a)** For a graphite epoxy unidirectional lamina, find the following: [10]

- i) Compliance matrix.
- ii) Minor Poisson's ratio.
- iii) Strains in the 1-2 coordinate system, if the applied stresses are  $\sigma_1 = 2 \text{ MPa}$ ,  $\sigma_2 = -3 \text{ MPa}$ ,  $\tau_{12} = 4 \text{ MPa}$ .

The engineering elastic constants of the unidirectional graphite/epoxy lamina are  $E_1 = 181 \text{ GPa}$ ,  $E_2 = 10.3 \text{ GPa}$ ,  $\nu_{12} = 0.28$ ,  $G_{12} = 7.17 \text{ GPa}$ .

- b) Explain interference, undercutting. [6]

**Q8) a)** Discuss the loading and deflection of rubber springs used for simple and cylindrical shear loads. [8]

b) Discuss load deflection characteristics for “Belleville spring”. State the advantages of these springs. [8]

**Q9) a)** Two 10 teeth gears are to mesh without undercutting. The gears are generated using standard hob with 20° pressure angle. Module is 4 mm while clearance is 0.2 mm. Using extended centre distance method. Find

i) Hob shift

ii) Blank diameter and depth of cutter setting

iii) Actual pressure angle.

Take usual notations,

$$\theta = \text{inv}\phi$$

$$\phi = v - \frac{2}{15}v^3 + \frac{3}{175}v^5 \text{ where } v = \sqrt[3]{3\theta}$$

$\theta$  and  $\phi$  are in radians. [10]

b) List out and explain any one Fatigue strength improvement techniques. [6]

**Q10) Write short notes on:** [18]

a) Transverse shear effects in composite laminates.

b) Low cycle and high cycle fatigue.

c) Surge in springs.



Total No. of Questions : 8]

SEAT No. :

**P4244**

**[4860]-642**

[Total No. of Pages : 3

**M.E. (Mechanical) (CADME)  
MATHEMATICAL MODELING  
(2012 Course) (Semester-I) (502402)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Section-I & II should be written on separate answer book.*
- 3) *Draw diagrams wherever necessary.*
- 4) *Use of scientific calculator is allowed.*
- 5) *Assume suitable data wherever necessary.*

**SECTION-I**

**Q1) a)** Solve the Laplace equation  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  subjected to the condition  
 $u(0, y) = D, u(u, y) = 8 + 2y \quad Y(x, 0) = x^2 / 4, u(x, u) = x^2$  with  $\Delta x = \Delta y = 1$  in  
 $u < x < 2, u, y, 2$ . **[8]**

b) Using given matrix reduce the following matrix to the tridiagonal form

$$A = \begin{bmatrix} 6 & 3 & 4 \\ 4 & 6 & 4 \\ 3 & 5 & 6 \end{bmatrix}. \quad \text{[8]}$$

**Q2) a)** Solve the boundary value problem by Galerkins Method

$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} - y = 4x^2, \quad y(0) = 1, y(1) = 1 \quad \text{[10]}$$

b) Find the extremals of the isoperimetric problem  $I[y(x)] = \int_{x_0}^{x_1} y^2 dx$ . Given

$$\text{that } \int_{x_0}^{x_1} y dx = c, \text{ a constant.} \quad \text{[6]}$$

**P.T.O.**

**Q3) a)** A tightly stretched string with fixed end points  $x = 0$  and  $x = 1$  is initially in a position given by  $y = y_0 \sin^3[\pi x/l]$ . If it is released from rest from this position, find displacement  $y(x, t)$ . **[6]**

b) Find the number of real and complex root of polynomial equation  $4x^4 + 2x^2 - 1 = 0$  using Sturm sequences. **[10]**

**Q4) a)** Find the smallest eigen value by inverse iteration method

$$\begin{bmatrix} 4 & -2 & 0 & 0 \\ -2 & 4 & -2 & 0 \\ 0 & -2 & 4 & -2 \\ 0 & 0 & -2 & -2 \end{bmatrix} [x] = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \text{ using starting vecto } \{x\}^T = \langle 1111 \rangle.$$

**[8]**

b) Using Jacobi's method to find eigen values of the matrix

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}. \quad \text{[10]}$$

### SECTION-II

**Q5)** The weight of the calf taken at weekly interval are given below. Fit a straight line using the method at least square and find the average rate of growth for a week **[16]**

Age	1	2	3	4	5	6	7	8	9	10
Weight	41	51	62	70	73	81	83	93	100	104

**Q6) a)** Find the deflection of the vibrating string of unit length having fixed ends with initial velocity zero and initial deflection  $f(x) = K (\sin x - \sin 4x)$ . **[8]**



- b) The following table gives the values of  $f(x)$  at the equal interval of  $x$ . [8]

$x$	0	0.5	1	1.5	2
$f(x)$	0.48	0.41	0.33	0.29	0.14

- Q7)** a) Using Laczos method calculate two smallest eigen values and eigen

vectors of  $\begin{bmatrix} 4 & -1 & 0 & 0 \\ -1 & 4 & -1 & 0 \\ 0 & -1 & 4 & -1 \\ 0 & 0 & -1 & -1 \end{bmatrix} [x] = \lambda \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$  using starting vector  $\{x\}^T = \langle 11111 \rangle$ . [8]

- b) What are the approaches in determining the sample size? Explain. [8]

- Q8)** a) Weight of the 10 students is as follows. [10]

Sr.	1	2	3	4	5	6	7	8	9	10
Weight	20	41	48	54	47	41	56	51	54	50

Can we say that the variance of the distribution of weight of all students from which the above sample of 8 students was drawn is equal to 20 Kg? Test this at 5% and 2% level of significance.

- b) Determine the size of the simple for estimating the true weight of the serial containers for the universe with  $N = 5000$  on the basis of the following information. [8]

- The variance of weight = 4 Dunces on the basis of past record.
- Estimate should be within 0.8 Dunces of the true average weight within 99% probability.



Total No. of Questions : 8]

SEAT No. :

**P4665**

[Total No. of Pages : 2

**[4860] - 643**

**M.E. (Mechanical) (Computer Aided Design, Manufacturing & Engineering)**

**COMPUTERAIDED DESIGN**

**(2012 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:-*

- 1) *Attempt any three questions from each section.*
- 2) *Figures to the right indicate full marks.*

**SECTION - I**

**Q1) What is Hermite cubic spline curve? Where it is used? [16]**

Explain the curve with its Hermite matrix and geometry vector representation.

**Q2) Explain features of surface model. Find minimum distance between point in space and a plane surface? Represent ruled surface in parametric form [16]**

**Q3) Explain and represent with design application [16]**

- a) B-spline surface
- b) Triangular patches

**Q4) Discuss the following concepts? [18]**

- a) Sculptured surface and surface intersection manipulation
- b) Orthogonal and perspective transformations.

**SECTION - II**

**Q5) What are different techniques to represent solids? Explain in brief. [16]**

Explain CSG technique in details with

- a) Basic elements and types of trees
- b) Data structure and applications

**P.T.O.**

**Q6)** Discuss the following **[16]**

- a) STEP architecture, its features and implementation
- b) Design by features and techniques for visual realism

**Q7)** Comment on following concepts **[16]**

- a) Variation and parametric modeling
- b) Design by features and AI in design

**Q8)** Explain in brief **[18]**

- a) Assembly and tolerance modeling
- b) Collaborative design, principles and applications.



Total No. of Questions : 8]

SEAT No. :

**P4532**

**[4860] - 645**

[Total No. of Pages : 2

**M.E. (Mechanical CADME)**

**b-ADVANCED MANUFACTURING PROCESS**

**(2012 Course) (Elective - I) (502404) (Semester - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Question no 1 and 8 are compulsory.*
- 2) *Solve any two questions out of rest questions in each section.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rules, molliar charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Discuss in detail the theory of metal cutting proposed by Merchant with a sketch of Merchant's circle. **[10]**
- b) How cutting forces are measured? Explain the different types of dynamometers used in metal cutting. **[8]**
- Q2)** a) Under what conditions are diamond, boron carbide and cubic boron nitride used as abrasive materials for making Grinding wheel? **[8]**
- b) What are the grinding process parameters that are of interest? Explain their effect on the grinding performance and the wear rates. **[8]**
- Q3)** a) State assumptions made in determination of a shear angle and derive it. **[8]**
- b) The following equation is given for Tool Life in Turning Operation: **[8]**

$$VT^{0.13}f^{0.77}d^{0.37} = C$$

A 60 minute tool life was obtained while cutting at  $V = 30\text{m/min}$ ,  $f = 0.3\text{ mm/rev}$  and  $d = 2.5\text{mm}$ . Determine the change in tool life if the cutting speed, feed and depth of cut are increased by 20% individually and also taken together.

**P.T.O.**

- Q4)** a) Explain the various stages involved in the Sintering Process in detail. [8]  
b) Describe the various Powder injection molding techniques in detail. [8]

### SECTION - II

- Q5)** a) Give the classification of unconventional machining process in detail and discuss the significance of same. [8]  
b) Describe the effect of various process parameters on MRR for AJM in detail. [8]

- Q6)** a) Write a detail note on construction, Material and Tool Design for USM process. [8]  
b) Write a detail note on Historical Perspective & Economics of High Speed Machining. [8]

- Q7)** a) Discuss the core issues involved in Rapid Prototype technology. [8]  
b) Explain in detail layer by layer and fused deposition modeling techniques. [8]

- Q8)** Write a short note on any three of the following: [18]
- a) Material properties at high strain rate.
  - b) Generative manufacturing processes.
  - c) Plasma Arc Cutting Process.
  - d) Process parameters of ECG.
  - e) Significance of CAD and GMP in Rapid Prototyping.



Total No. of Questions : 8]

SEAT No. :

**P4533**

**[4860] - 647**

[Total No. of Pages : 2

**M.E. (Mechanical CADM & E)**  
**d - CAD/CAM PRACTICES IN METAL FORMING**  
**(2012 Course) (Semester - I) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

**SECTION - I**

**Q1)** Explain the following terms in the context of metal forming: **[18]**

- a) Hems
- b) Manual Relief Cut
- c) Break Corner
- d) Jog
- e) Curved Edge Flanges
- f) Flat Pattern

**Q2)** a) Elaborate Press Control System and its components in forming. **[8]**

b) What is Hydro forming? Explain in detail with working principle. **[8]**

**Q3)** a) Define and explain the concept of True Stress and True Strain. What is the significance in forming. **[8]**

b) Describe the various components and working of Hydraulic press for forming. **[8]**

**P.T.O.**

- Q4)** a) What different properties of metal have significant effect on formability? Elaborate any four in detail. [8]
- b) Explain Flow Slip Line Field Theory. [8]

**SECTION - II**

- Q5)** Explain in detail Mechanics of metal working. What is the role of temperature? How friction and Lubrication affects the drawing process quality? Elaborate. [18]
- Q6)** a) Explain any two methodologies for calculation of Punch Load in Drawing. [8]
- b) Describe Embossing and Coining operation with suitable Sketches. [8]
- Q7)** a) What is Failure Limit Curve? Discuss the FLC proposed by Keeler and Goodwin. [8]
- b) Discuss the Progressive Die and Compound Die in detail. [8]
- Q8)** a) Define and explain the terms Blank Holder Force, Drawbead, Formability and fracture. [8]
- b) Explain the 3D state of stress in deep drawing with suitable sketch. [8]



Total No. of Questions : 8]

SEAT No. :

**P4245**

**[4860]-648**

[Total No. of Pages : 3

**M.E. (CADME)**

**FINITE ELEMENT ANALYSIS**

**(New 2012 Course) (502405)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION-I**

**Q1)** a) Explain basics steps in FEM. **[8]**

b) Write in detail Rayleigh-Ritz methods. **[8]**

**Q2)** Solve the following equation using Galerkin's Method (Use at least two parameters solution)

$$dy / dx = 60(1 + \cos x) - 0.05y, 0 \leq x \leq 1$$

$$y(0) = 250. **[16]**$$

**Q3)** Solve the following equation using a two parameter trial solution by

- i) Point collocation method (Residual at  $x = 1/3$  and  $x = 2/3$  made equal to zero).
- ii) Galerkin method

$$\frac{dy}{dx} - x = 0$$

$$\text{with } y(0) = 1 \text{ and domain from } x = 0 \text{ to } x = 1. **[16]**$$

**P.T.O.**



- Q4) a)** The fixed bar shown in fig. 1 has axial forces applied at  $L/3$  and  $2L/3$ . Use FEM to compute the axial deflection and support reaction? [10]

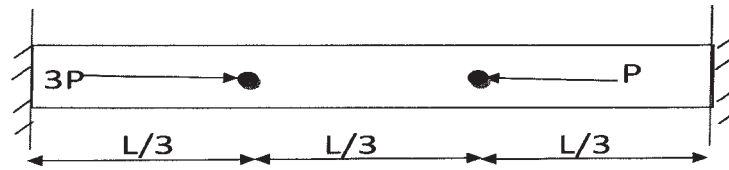


Fig1.

- b) Distinguish between Newton Raphon and Modified Newton Raphon Method. [8]

### SECTION-II

- Q5)** Determine the two eigenvalues and eigenvectors corresponding to the two nonzero masses, using the method of subspace iteration.

$$[K] = \begin{vmatrix} 2 & -1 & 0 & 0 \\ -1 & 2 & -1 & 0 \\ 0 & -1 & 2 & -0 \\ 0 & 0 & -1 & 1 \end{vmatrix}$$

$$[K] = \begin{vmatrix} 2 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{vmatrix} \quad [16]$$

- Q6) a)** Explain in detail Linear Buckling analysis. [8]
- b) Explain the formulation of dynamic problem. [8]

**Q7) a)** Classify different types of dynamic problems. Explain briefly which matrix equations are solved in **[10]**

i) Free Vibration problems.

ii) Transient problems.

b) Find first two natural frequencies of a bar with following details:

Length = 1 m,  $E = 2 \times 10^5$  MPa, Density = 7000 Kg/m<sup>3</sup>, Area = 40 mm<sup>2</sup>.

Use two elements and lumped mass matrix approach. **[8]**

**Q8) a)** Differentiate between h and p refinement techniques with suitable examples. **[8]**

b) Explain what do you understand by sub modelling. Give practical examples where the approach is useful. **[8]**



Total No. of Questions :8]

SEAT No :

**P4246**

**[4860] - 649**

[Total No. of Pages : 2

**M.E. (Mechanical - CADM & E)**

**b: INTEGRATED PRODUCT DESIGN & DEVELOPMENT (502405)  
(2012 Pattern) (Semester-I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of Calculator is allowed.*
- 5) Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) Explain Various factors demanding PLM Implementation and elaborate. **[9]**
- b) Discuss Technology S Curve with suitable example. What is Importance of Technology Forecasting? **[9]**
- Q2)** Explain the concept of Quality Function Deployment with suitable example. How customer demands are collected from market? Discuss any two techniques. **[16]**
- Q3)** a) What is customer need? How quality of product is concerned with customer need? State and Discuss various customer needs in detail. Discuss FAST Method. **[16]**
- Q4)** a) Differentiate Product Design versus Product Development in detail. **[8]**
- b) Explain the concept of Collaborative Engineering in detail. **[8]**

**P.T.O.**

## SECTION - II

- Q5)** Explain the process of Product Tear Down in detail. What are objectives? How post tear down reports are created? Explain. **[16]**
- Q6)** a) What is Prototype? What are different types of prototypes? Elaborate advantages. **[8]**  
b) Explain the concept of Design of experiments. **[8]**
- Q7)** a) Discuss design for manufacturing and assembly guidelines. **[8]**  
b) What is System Functionality? Elaborate from the prospective of Product Design. **[8]**
- Q8)** Define Benchmarking. Enlist objectives and advantages. Discuss the detailed procedure for Benchmarking with suitable example. **[18]**



Total No. of Questions :8]

SEAT No. :

**P4468**

**[4860]-65**

[Total No. of Pages :2

**M.E. (Civil - Environmental Engg.)**

**INDUSTRIAL WATER AND WASTE WATER MANAGEMENT**

**(2008 Course) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Uses of non programmable calculators are allowed.*
- 3) *Neat sketches to be drawn wherever necessary.*
- 4) *Make suitable assumptions if necessary.*
- 5) *Figures to the right indicates full marks.*

**SECTION -I**

- Q1)** a) Discuss the characteristics of industrial and municipal waste waters. [8]  
b) What is water quality index? Discuss its application for Industrial waste water management. [10]
- Q2)** a) Importance of equalization and Neutralization for Industrial waste water treatment. [8]  
b) Discuss the waste reduction approach for Industrial waste water management. [8]
- Q3)** a) Discuss how will you treat high COD Industrial waste water stream. [8]  
b) Discuss the Membrane Separation process for Industrial waste water treatment. [8]
- Q4)** Discuss the manufacturing process and effluent streams generated with characteristics from  
a) Dairy Industry. [9]  
b) Distillery Industry. [9]

***P.T.O.***

## SECTION -II

- Q5)** Discuss the raw waste water characteristics and treatment options for the waste water from
- a) Mineral processing industries. [9]
  - b) Atomic energy plants. [9]
- Q6)** Discuss the treatment and disposal options for
- a) Textiles Industry. [9]
  - b) Steel Industry. [9]
- Q7)** a) Discuss the Industrial ecology for waste water management. [8]
- b) Discuss the water requirement for fertilizer Industry. [8]
- Q8)** Explain the concept of Common Effluent Treatment Plants. Discuss the basic issues like treatability studies and principles involved in the design of CETP for heterogeneous industrial estates. [16]

*EEE*

Total No. of Questions : 10]

SEAT No. :

P4534

[4860] - 651

[Total No. of Pages : 3

M.E. (Mechanical) (CADME)  
d-ROBOTICS

(2012 Pattern) (Semester - I) (Elective - II) (502405)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate answer books.
- 2) Attempt any three questions from each section.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of Electronic pocket Calculator is allowed.
- 6) Assume Suitable data, if necessary and mention it clearly.

**SECTION - I**

- Q1)** a) Enlist different types of robot configurations and explain articulated type of robot configuration in detail. [10]
- b) Explain what type of robot configuration is suitable for the following applications: [8]
- i) Material Handling.
  - ii) Welding of pipes.

- Q2)** a) The link parameters for the SCARA robot is shown in Table 1. Compute the concatenated transformation matrix for each link and also find total transformation matrix for the entire configuration from initial to final link position. [10]

Link i	$a_i$	$\alpha_i$	$d_i$	$\theta_i$
1	$L_{11}$	0	$L_{12}$	$\Theta_1$
2	$L_2$	0	0	$\Theta_2$
3	0	180	$D_3$	0
4	0	0	$L_4$	$\Theta_4$

Table 1, Q No. 2(a)

- b) Explain briefly Euler's angle representation. [6]

P.T.O.

- Q3)** a) A point P(5, 4, 3) is attached to a frame (u v w) is subjected to the transformations. All the following transformations are relative to the current moving frame. [8]
- A rotation of  $90^\circ$  about u-axis.
  - Translation of (3, -4, 5) along uvw.
  - Followed by rotation of  $90^\circ$  about w-axis. Find the new coordinate points of a frame.
- b) Explain D-H convention for three axis articulated robot arm. [8]
- Q4)** a) What is trajectory planning and explain its role in robotics. [7]
- b) Determine the time required for each joint of a three axis RRR manipulator to travel the following distances using slew motion joint 1:  $10^\circ$ , joint 2:  $20^\circ$  and joint 3:  $30^\circ$ . The joint 1, 2 and 3 are travel at a rotational velocity of  $30^\circ/\text{s}$ ,  $45^\circ/\text{s}$  and  $60^\circ/\text{s}$  respectively. [9]
- Q5)** a) Explain singularities of the RPY wrist. [8]
- b) Explain the procedure to obtain rotary joint jacobian. [8]

### SECTION - II

- Q6)** a) Using the L.E. formulation used for describe the rigid body dynamics of the robot manipulator. [10]
- b) Explain geometric approach to inverse kinematics. [8]
- Q7)** a) Explain integral type of controller with the help of block diagram. [8]
- b) Explain the basic functions of robot vision system. [8]
- Q8)** a) With the help of neat sketch explain working of velocity and acceleration sensors. [8]
- b) A certain video camera has a  $256 \times 256$  pixel matrix. Each pixel must be converted from analog to digital signal by A/D converter. The A/D conversion process takes 0.1 micro second to complete. Assuming that there is no loss time between two pixels, how long it will take to collect the image data for one frame and is this time compatible with processing at the rate of 30 frames per second. [8]



- Q9)** a) Describe the VAL and AML robot language in brief. [8]
- b) In a pallet object protruding 40mm from the face of the pallet located in a number of rows and column as shown in figure 2. The plane of the pallet is assumed to be parallel to XY plane. The object are to be picked up one after another from the pallet and placed in allocation chute. [8]

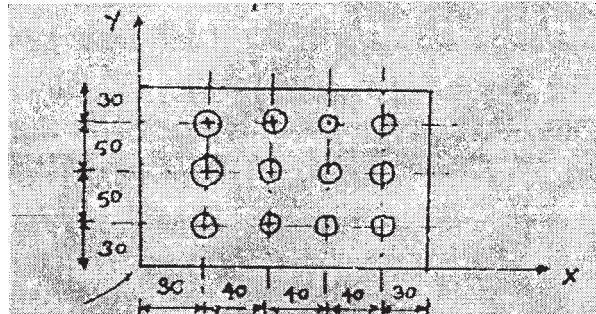


Figure2, Q No. 9(b)

- Q10)** a) Technique to represent knowledge in artificial intelligence. [6]
- b) Future applications of robots. [5]
- c) Use of capacitive and ultrasonic sensors in robots. [5]



Total No. of Questions :8]

SEAT No :

**P4247**

**[4860] - 652**

[Total No. of Pages : 2

**M.E. (Mechanical) (Mech.-CADME)  
MANAGEMENT OF TECHNOLOGY  
(2012 Pattern) (Semester-II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume Suitable data if necessary.*

**SECTION - I**

- Q1)** a) Discuss the role and significance of technology and management. [8]  
b) Explain in detail classification of Technology. [8]
- Q2)** a) Discuss the relations between the organizational culture and structure of level of creativity and innovation. [8]  
b) Discuss key elements and principles for developing technology strategy. [8]
- Q3)** a) Discuss the concepts of growth curves and explain four phases of “S” curve with proper example. [8]  
b) Explain what do you mean by morphological analysis by stating its applications. [8]
- Q4)** Write a short note on. (Any three) [18]  
a) Types of Technologies and Forms of Technologies,  
b) Technology diffusion,  
c) Exploratory technological forecasting techniques,  
d) Technology performance parameters.

**P.T.O.**

## SECTION - II

- Q5)** a) Explain different factors affecting and channels of technology transfer. [8]  
b) Explain a generic model of the process of new product development. [8]
- Q6)** a) Discuss with appropriate example patentable and non- patentable inventions. [8]  
b) Discuss the concept of Invention and Innovation. [8]
- Q7)** a) Discuss the concept National Innovation Scheme. [8]  
b) Explain Analytical Hierarchical Process applied to industrial products. [8]
- Q8)** Write a short note on. (Any three): [18]  
a) Levels of technology transfer.  
b) Need of managing Research & development.  
c) Government schemes of Innovation.  
d) Intellectual property rights.



Total No. of Questions : 10]

SEAT No. :

P4535

[4860] - 653

[Total No. of Pages : 2

M.E. (Mechanical) (CADM & E)  
COMPUTERAIDED MANUFACTURING  
(502409) (2012 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answers to the two sections should be written in separate answer books.
- 2) Attempt any three questions from each section.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of electronic pocket calculator is allowed.
- 6) Assume Suitable data, if necessary and mention it clearly.

**SECTION - I**

- Q1)** a) Explain the working principle of numerical control Machine. [6]  
b) Explain soft automation used in production plant. [6]  
c) Explain the modern maintenance and diagnostics systems used in industries. [6]
- Q2)** a) Explain numerical control EIA coding systems. [8]  
b) Explain with neat sketch hard and soft wired CNC configurations. [8]
- Q3)** a) Explain word address manuscript formats used in NC part programming. [6]  
b) Write a complete NC part program for the component shown in Fig. 1. Draw the tool path and take raw material SS blank of 100 mm length and 60 mm diameter, spindle speed 300 RPM and feed 0.2 mm/rev. All dimensions are in mm [10]

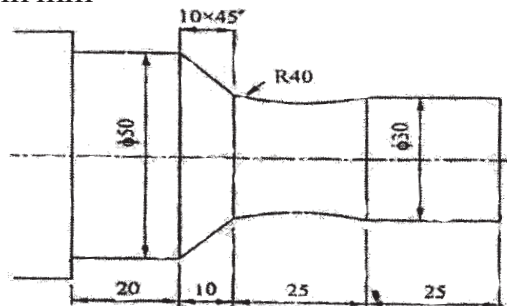


Fig. 1, Q. No.3(b)

P.T.O.

- Q4)** a) Explain the concept of drive surface and check surface. [6]
- b) Write a complete APT part program to generate end profile for the component shown in Fig. 2. Use post processor call statement MACHINE MILL, Draw the tool path and take Aluminum as raw material of 150 mm × 100 mm, spindle speed 400 RPM and feed 0.25 mm/rev. All dimensions are in mm [10]

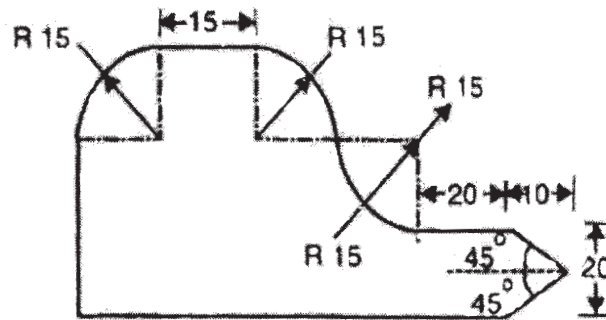


Fig.2, Q. No. 4(b)

- Q5)** a) Explain functions of DNC. [8]
- b) Adaptive control in NC programming. [8]

### SECTION - II

- Q6)** a) Explain OPTIZ GT part classification and coding systems. [10]
- b) Explain Role of GT in manufacturing processes. [8]
- Q7)** a) Explain the role of control system in FMS. [6]
- b) Explain in brief different types of FMS layout. [10]
- Q8)** a) Explain Esprit CIM-OSA model. [8]
- b) Draw neat sketch Siemens concept of CIM applicable to manufacturing enterprise. [8]
- Q9)** a) Explain the activities of production planning department. [6]
- b) Explain in brief types of CAPP along with its merits and limitations. [10]
- Q10)** a) Write short notes on ERP. [6]
- b) Explain with neat block diagram the principle of EDM. [5]
- c) Role of CMM in manufacturing. [5]



Total No. of Questions : 8]

SEAT No. :

P4536

[Total No. of Pages : 2

[4860] - 654

**M.E. (Mechanical) (CAD M & E) (Semester - II)**  
**COMPUTER INTEGRATED MANUFACTURING**  
**(2012 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any Three questions from each section.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of calculator is allowed.*
- 5) Assume suitable data if necessary.*

**SECTION - I**

**Q1) a)** Discuss the hardware requirements for CIM setup. **[9]**

b) Discuss the concept and need of Computer Integrated Manufacturing. **[9]**

**Q2)** Define Flexible Manufacturing System. Why FMS is required? Discuss in detail various elements of FMS. **[16]**

**Q3)** Define and explain DNC system with suitable sketch. Elaborate the concept of manufacturing integration. **[16]**

**Q4) a)** Discuss the concept of Product Data Management in detail. **[8]**

b) What is Engineering Data Management? State Limitations. **[8]**

**P.T.O.**

## SECTION - II

**Q5)** Define Lean Manufacturing. Explain the concept. What is waste? Discuss various types of wastes in detail. Enlist advantages of lean manufacturing. **[18]**

**Q6) a)** Explain the concept of Manufacturing Forecasting in detail. **[8]**

b) Discuss the concept of KANBAN. **[8]**

**Q7) a)** Discuss Process management for Web Based Manufacturing. **[8]**

b) Explain the application of web based manufacturing for Machining. **[8]**

**Q8)** What is Cellular manufacturing? Elaborate the concept. What is necessity of supply chain management? Discuss materials resource planning and in process inventory management. **[16]**



Total No. of Questions : 8]

**P4795**

SEAT No. :

[Total No. of Pages : 2

**[4860]-658**

**M.E. (Mechanical )**

**OPTIMIZATION TECHNIQUES**

**( 2012 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:-*

- 1) *Attempt any three questions from each section.*
- 2) *Answers to the two sections must be written in separate answer books.*
- 3) *Assume suitable data if necessary.*
- 4) *Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) Define optimization objective function, variables, constraints with one example. [9]  
b) State and explain optimality criterion for single variable, multivariable & constrained optimization [9]
- Q2)** a) Explain the algorithms & working of bounding Phase method. What is need of bracketing methods? [8]  
b) Describe the working & applicability of cubic search method. [8]
- Q3)** Optimize  $f(x) = x^2 + 54/x$  using Bisection method and second method. Comment on the optimum of both methods & compare performance. [16]
- Q4)** a) Find the optimum solution using simplex method [8]  
Maximize  $f(x) = 3x_1 + 9x_2$   
Subject to  $x_1 + 4x_2 \leq 8$   
 $x_1 + 2x_2 \leq 4$   
 $x_1, x_2 \geq 0$
- b) A carpenter has to manufacture chairs & tables from 400 cube feet wood & 450 labour hours. The Carpenter needs 5 cube feet of wood & 10 labour hours. For chair and 20 cube feet of wood & 15 labour hours for table. The carpenter gets profit of Rs. 800 & Rs. 1000 for chair & table respectively. The objective is to maximize profit, formulate the problem.[8]

**P.T.O.**



## SECTION - II

**Q5)** Minimize  $f(x_1, x_2) = (x_1^2 + x_2 - 11)^2 + (x_1 + x_2^2 - 7)^2$

$$0 \leq x_1, x_2 \leq 5$$

using Powell's conjugate direction method & Cauchy's method. Compare performance & comment. **[18]**

**Q6) a)** Explain the concept & working of Geometric programming. What are limitations? **[8]**

**b)** What genetic algorithms? Elaborate & list advantages. **[8]**

**Q7) a)** List various strategies applied for constraint handling, Explain any one in detail. **[8]**

**b)** What is Kuhn-Tucker condition. Explain why it is applied for constrained optimization. **[8]**

**Q8)** Minimize  $(x_1^2 + x_2)^2 + (x_1 + x_2^2)^2$  **[16]**

$$\text{Subject to } (x_1 - 5)^2 + x_2^2 - 26 \geq 0$$

$$x_1 \geq 0, x_2 \geq 0$$

using penalty function & method of multipliers



Total No. of Questions :8]

SEAT No :

**P4248**

**[4860] - 659**

[Total No. of Pages : 2

**M.E. (Mechanical - CADME)**

**PRODUCT LIFECYCLE MANAGEMENT**

**(2012 Course) [502412-A]**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Attempt any three questions from each section.*
- 2) *Figures to the right indicate full marks.*

**SECTION - I**

**Q1)** Discuss the emergence of PLM from PDM and EDM. Why PLM is required in current industrial Scenario of competitive manufacturing. **[18]**

**Q2)** Explain in detail various threads of PLM. Describe how they are inter Connected. **[16]**

**Q3)** What is Product Data and Workflow? Explain significance in PLM. What are key management issues with product data? Elaborate. **[16]**

**Q4)** Explain the concept of collaborative product development in detail. Discuss engineering workflow acquisition and implementation. **[16]**

**SECTION - II**

**Q5)** Explain the concept of hardware and document management in detail. What is configuration management for product structure. **[18]**

***P.T.O.***

**Q6)** Discuss in detail Entity-Relationship model and Relational model for database Management. **[16]**

**Q7)** Explain Different phases of product lifecycle and corresponding technologies in detail. **[16]**

**Q8)** Discuss visualization, collaboration and enterprise application integration in PLM. Explain how change management is implemented in PLM. **[16]**



Total No. of Questions :10]

SEAT No. :

**P4469**

**[4860]-66**

[Total No. of Pages :2

**M.E. (Civil - Environmental Engineering)**

**ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY**

**(2008 Course) (Semester - II) (501509)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Assume suitable data if necessary.*

**SECTION -I**

- Q1) a)** Enlist wastewater impurities? State various methods of analysis used in environmental Engg. **[10]**
- b) Explain importance of colloidal chemistry and nuclear chemistry used in environmental Engg. management. **[8]**
- Q2) a)** Explain nuclear radiation, its impact on human health & uses of isotopes & tracers commonly used in environmental engg. **[10]**
- b) Describe principle & mechanism of optical methods in pollutant removal in industrial wastewater with advantages & disadvantages. **[6]**
- Q3)** Explain principle of Atomic Adsorption spectrophotometer (AAS) and flame photometer along with sketch, its working, merits & demerits. **[16]**
- Q4)** Explain in detail High performance liquid chromatography and its limitations over gas chromatography. **[16]**
- Q5)** Explain ion chromatography and gas chromatography along with sketch, principle and its application in environmental engg. **[16]**

**P.T.O.**

## SECTION -II

- Q6)** Enlist various enzymes and metabolic reactions and their role in environmental microbiology. Also describe how enzymes are widely used in industries for environmental management. **[18]**
- Q7)** a) Explain role of micro-organisms, its cell structure metabolism and used in environmental engg. **[10]**
- b) Write short note on compound microscopy and micrometry. **[6]**
- Q8)** Describe different media and techniques of staining an enumeration of micro organism in water and wastewater. **[16]**
- Q9)** State soil Bioremediation? Its principle & application in removing soil contamination with suitable examples. **[16]**
- Q10)** a) Explain Biological process used in wastewater treatment along with principle. **[6]**
- b) Explain UASB (up flow anaerobic sludge blanket) reactor and SBR process with diagram and principle. **[10]**

*EEE*

Total No. of Questions : 8]

SEAT No. :

**P4662**

[4860] - 67

[Total No. of Pages : 2

**M.E. (Civil) (Environmental Engineering)**  
**SOLID WASTE AND HAZARDOUS WASTE MANAGEMENT**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Answer any three questions from section - I and section - II.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator and steam table is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** Discuss the Waste Management Planning for solid waste and hazardous waste management in India. **[18]**

Also discuss the environmental impact of mismanagement of solid and Hazardous wastes.

**Q2)** Describe “Radioactive fallout” and discuss its environmental hazards. **[16]**

Also discuss the control measures for low and high activity liquid radioactive waste.

**Q3)** For a Multispecialty hospital, located in Semi Urban area, how will you manage the solid waste generated from this hospital including biomedical waste? **[16]**

**Q4)** Write a short note on following (All) : **[16]**

- a) Indian Legislation on Handling & Management of MSW.
- b) Radioactive waste management in Nuclear power plant.
- c) Labeling and Handling of Hazardous Waste.
- d) Transfer Stations.

**P.T.O.**

## **SECTION - II**

**Q5)** Explain the site selection criteria for sanitary landfills. Also discuss the design of landfills. State the advantages and limitations of land filling. **[18]**

**Q6)** Discuss the leachate and landfill gas management. **[16]**

**Q7)** What are Biomedical wastes? Discuss the various treatment and disposal options for the same. **[16]**

**Q8)** Write short notes on :

a) Financial Aspects of Solid Waste Management **[6]**

b) Management of Nuclear Waste **[5]**

c) Landfill Bioreactors **[5]**



Total No. of Questions :8]

SEAT No. :

**P4470**

**[4860]-68**

[Total No. of Pages :3

**M.E. (Civil - Environmental Engineering)**

**a-GROUNDWATER CONTAMINATION AND POLLUTION TRANSPORT**

**(2008 Course) (Semester - II) (Elective - III)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if necessary clearly mentioning the same.*
- 4) *Use of non-programmable scientific calculator is allowed.*

**SECTION -I**

- Q1)** a) Explain in detail, the importance of G.W. What are the sources of pollution for GW? Enlist 4 assumptions made in deriving general differential equations for GW flow. **[8]**
- b) Explain in detail the steady state continuity equation for GW flow in a homogeneous isotropic aquifer. **[8]**
- Q2)** a) Explain how to find yield from a well. **[10]**
- b) Explain the procedure for drawing flow nets using: **[8]**
- i) Graphical Method.
  - ii) Numerical solution.
- Q3)** a) Explain with suitable sketch: well interference. **[6]**
- b) Tracer injected into a well took 4.5 hours to travel up to another well 50 m apart. The difference in water surface elevation was found to be 1.25 m; the aquifer samples indicated a porosity of 35%. Determine the following: **[6]**
- i) Permeability.
  - ii) Seepage velocity and
  - iii) Reynold's no. of flow.
- Assume average grain size as 1 mm and kinetic viscosity at 27 deg C. for water as 0.008 Stokes.
- c) Explain in brief sea water intrusion. **[4]**

**P.T.O.**



- Q4) a)** Assume that three piezometers are installed very close to each other but penetrate up to different depths as given below: [6]

Piezometer	l	m	n
Elevation at surface (m)	550	550	550
Depth of piezometer (m)	125	100	75
Depth of Water (m)	20	42	35

Let L, M and N refer to the points of measurement of piezometers l, m and n respectively. Calculate:

- i) GW head at l, m and n in meters.
  - ii) Pressure head at l, m and n in m.
  - iii) Fluid pressure at M in  $N/m^2$ .
- b) Distinguish between ground surface contour and water table contours. Explain how water table contours are prepared and state their uses. [6]
- c) Explain the following terms: [4]
- i) Aquifer
  - ii) Aquiclude
  - iii) Aquifuge
  - iv) Aquitard

### SECTION -II

- Q5) a)** Explain GW availability in Maharashtra with special reference to geology of the area. [8]
- b) Explain need of social awareness and public participation in GW recharging activities. Support your answer with one case study from Maharashtra. [8]
- Q6) a)** Explain in detail relation between dispersion and GW hydrology. [8]
- b) Explain in detail how GW pollution phenomenon can be studied. Support your answer with special reference to a case study of open dumping site for MSW. [8]

- Q7)** a) Explain the importance of geotechnical investigations required for carrying out GW potential in an area. [8]
- b) Explain underground travel phenomenon of GW contamination. Support your answer with a case study. [8]
- Q8)** a) Explain the importance of water analysis and water quality requirements with special reference to GW as source for: [9]
- i) Drinking purpose.
- ii) Agriculture purpose.
- iii) Industrial Usage.
- b) Explain in detail: Sea Water Intrusion. [9]

*EEE*

Total No. of Questions : 8]

SEAT No. :

P3986

[Total No. of Pages : 2

[4860] - 69

**M.E. (Civil) (Environmental Engineering)**

**AGRICULTURAL POLLUTION CONTROL AND ENVIRONMENTAL  
BIOTECHNOLOGY**

**(2008 Pattern) (Elective - III) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**Section - I**

- Q1)** a) Understanding virtual water will help to understand crop suitability in an area. Explain in detail. [8]  
b) What are the climatic effects on farming systems? Explain. [8]
- Q2)** a) Enlist any four agrochemicals. What are the uses of these agrochemicals? [8]  
b) What is an importance and scope of meteorology in agriculture? Explain any two agro meteorological parameters. [8]
- Q3)** a) What are the remedial measures to rejuvenate water logged area? [8]  
b) Which type of waste of sugar industry can be utilized for agricultural purpose? What are the benefits of the same? [8]

***P.T.O.***

- Q4)** Write short notes on : **[18]**
- a) Water requirement for different crops.
  - b) Bioremediation of soil.
  - c) Conservation of fertilizers.

**Section - II**

- Q5)** a) Explain replication of DNA. **[8]**  
b) Understanding concepts of genetic engineering is very important for an agricultural engineer. Explain. **[8]**
- Q6)** a) What is an importance of microorganisms in Activated Sludge Process? Explain. **[8]**  
b) Draw and explain treatment flow sheet for sugar industry waste. **[8]**
- Q7)** a) Explain suitability of vermi-composting for agricultural area. **[8]**  
b) Explain the suitability of root zone treatment for waste management. **[8]**
- Q8)** Write short notes on the following : **[18]**
- a) Protein Synthesis.
  - b) UASB.
  - c) Rotating drums.



Total No. of Questions : 8]

SEAT No. :

**P3954**

**[4860] - 7**

[Total No. of Pages : 2

**M.E. (Civil) (Construction and Management)**

**CONSTRUCTION SAFETY**

**(2008 Pattern) (Elective - I(d))**

*Time :4 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Question No 1 and question No 5 are Compulsory. Answer any 2 questions from (Q.2 to Q.4), any 2 questions from (Q.6 to Q.8).*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Electronic Pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Why is Safety management important in construction sector. Explain with an example. [8]
- b) State and explain duties and responsibilities of [10]
- i) Top management and safety officers
  - ii) General employees and safety committee
- Q2)** What is meant by an accident? Explain the different causes of accidents on construction site. Enlist costs associated with accident explain with an example. [16]
- Q3)** What is meant by PPE? State the importance of all the PPE along with their application. State the criteria for selection of PPE. [16]
- Q4)** Write a note on : [16]
- a) Equipment Safety for cranes and safety of scaffolding and working platforms.
  - b) Safety Training.

**P.T.O.**

## SECTION - II

- Q5)** Prepare a safety program for : **[18]**
- a) Tunnel construction in soft soil
  - b) Underwater concreting
- Q6)** a) Discuss common hazards while using cranes and hoists on construction site. **[8]**
- b) Discuss in detail clauses of workman's compensation act. **[8]**
- Q7)** a) Prepare a checklist for : **[10]**
- i) Cofferdam
  - ii) Use of explosives in tunnel construction
- b) State the importance of first aid on construction site. **[6]**
- Q8)** Discuss various safety precautions to be followed on site for following activities : **[16]**
- a) Installation of Caissons
  - b) Pile boring
  - c) Shotcreting
  - d) Dewatering by well point systems



Total No. of Questions :8]

SEAT No. :

**P4471**

**[4860]-70**

[Total No. of Pages :2

**M.E. (Civil) (Environmental Engineering)**  
**c - ENVIRONMENTAL SANITATION**  
**(2008 Course) (Semester - II) (Elective - III)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION -I**

- Q1)** a) Which micro-organisms are responsible for communicable diseases? What are the methods of communication? [8]
- b) Explain the diseases communicated by the discharges of intestines, nose and throat. Specify also the control measures to be taken. [8]
- Q2)** a) Describe in detail methods adopted to control Plague. [8]
- b) Explain the natural and chemical factors of diseases control methods.[8]
- Q3)** a) Write down about the life cycle of a mosquito and explain preventive measures to control breeding. [8]
- b) Explain the factors affecting Industrial sanitation. [8]
- Q4)** Write short notes on: [18]
- a) Hospital Sanitation.
  - b) Rodents and public health.
  - c) Light and ventilation in public buildings.

***P.T.O.***

## SECTION -II

- Q5)** a) What is an Occupational hazard? Explain the common workplace hazards. [8]  
b) Write down only the list of workplace Environmental ISO standards. [8]
- Q6)** a) Comment in detail on Population habits in Rural area and correlate the same with environmental sanitation. [8]  
b) Comment on “Improvement schemes for rural sanitation”. [8]
- Q7)** a) Explain the Necessity of excreta disposal systems in rural areas. [8]  
b) What are the problems of water supply in rural areas? How to nullify the same. Explain. [8]
- Q8)** Write short notes on: [18]  
a) Toilet linked biogas plants.  
b) Control of dust pollution in industry.

*EEE*



Total No. of Questions :8]

SEAT No. :

**P4472**

**[4860]-71**

[Total No. of Pages :2

**M.E. (Civil - Environmental Engineering)**

**a-GROUNDWATERCONTAMINATIONANDPOLLUTION TRANSPORT**

**(2008 Course) (Semester - II) (Open Elective) (Elective - IV)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if necessary clearly mentioning the same.*
- 4) *Use of non- programmable scientific calculator is allowed.*

**SECTION -I**

- Q1) a)** Explain with neat sketch Aquifer classification based upon the hydraulic conductivity of the media. **[8]**
- b) Distinguish between ground surface contour and water table contours. Explain how water table contours are prepared and state their uses. **[8]**
- Q2) a)** Explain in detail various factors that govern contamination of ground water. **[8]**
- b) How dispersion studies are helpful in understanding the GW flow. **[8]**
- Q3) a)** Explain with reference to urban area how contamination of GW can be reduced by adopting proper wastewater management practices? **[8]**
- b) Tracer injected into a well took 4.5 hours to travel up to another well 45 m apart. The difference in water surface elevation was found to be 1.25 m; the aquifer samples indicated a porosity of 30%. Determine the following: **[6]**
- i) Permeability.
  - ii) Seepage velocity and
  - iii) Reynold's no. of flow.
- Assume average grain size as 1 mm and kinetic viscosity at 27 deg C. for water as 0.008 Stokes.
- c) Explain in brief the ways to curb sea water intrusion. **[4]**

**P.T.O.**

- Q4)** a) Explain the importance of geotechnical investigations in GW studies. [8]  
b) An organic waste with very high has contaminated a GW aquifer. Explain in detail the method to be adopted for recovering this aquifer. [8]

### SECTION -II

- Q5)** a) Explain how the rock forms affect the GW availability wrt various rock types. [9]  
b) Explain role of tracer studies in ascertaining GW potential and contamination. [7]
- Q6)** a) What is sea water intrusion? Explain Ghyben - Herzberg relation wrt confined and unconfined aquifers. [12]  
b) Comment on GW scenario of Maharashtra. [4]
- Q7)** a) Explain the importance of physico-chemical and biological analysis of GW. [8]  
b) Explain quality requirements for water for: [8]  
i) Domestic Use.  
ii) Industrial Use.
- Q8)** a) Explain Tri-linear diagram for representing analyses of GW Quality. [10]  
b) Enlist various methods of GW recharge. Explain any one in detail. [8]

*EEE*

Total No. of Questions :8]

SEAT No. :

**P4473**

**[4860]-72**

[Total No. of Pages :2

**M.E. (Civil) (Environmental Engineering)**

**b - ENVIRONMENTAL SANITATION**

**(2008 Course) (Semester - II) (Open Elective - IV)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data if necessary.*

**SECTION -I**

- Q1)** a) Which micro-organisms are responsible for communicable diseases? What are the methods of communication? [8]
- b) List down the communicable diseases and their mode of transmission.[8]
- Q2)** a) What is “mosquito control”? Why should mosquitoes be controlled? How is mosquito control accomplished? [8]
- b) Explain the natural and chemical factors of diseases control methods.[8]
- Q3)** a) In order for your Rodent control program to be effective on a long term basis, what measures will you adopt? Explain. [8]
- b) How will you achieve sanitation in case of Cinema Theaters? Explain.[8]
- Q4)** Write short notes on: [18]
- a) Bio-control method of fly breeding.
  - b) Insecticide.
  - c) Light and ventilation in hospitals.

**P.T.O.**

## SECTION -II

- Q5)** a) How to control dust and noise pollution in Thermal Power Plant? Explain. [8]  
b) Write down only the list of workplace Environmental ISO standards. [8]
- Q6)** a) Discuss in detail the various problems associated with Rural Sanitation. [8]  
b) Comment on “Improvement schemes for rural sanitation”. [8]
- Q7)** a) Explain any one case study on sanitation. [8]  
b) What are the occupational hazards in industry? Explain. [8]
- Q8)** Write short notes on: [18]  
a) Soak pit with a neat sketch.  
b) Heat stress.



Total No. of Questions : 8]

SEAT No. :

P3987

[Total No. of Pages : 4

[4860] - 73

**M.E. (Mechanical) (Heat Power Engineering)**

**NUMERICAL METHODS IN THERMAL AND FLUID ENGINEERING  
(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from section I and three questions from section II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**Q1)** a) Using LU Decomposition method solve the following set of Simultaneous equations, **[12]**

$$2x + 3y + z = 9$$

$$x + 2y + 3z = 6$$

$$3x + y + 2z = 8$$

b) What is pivoting? Distinguish between partial pivoting and complete pivoting. **[4]**

**Q2)** a) Given the table of data : **[9]**

x	1	2	3	4
z	0	1	2	3
y	12	18	24	30

Obtain a regression plane to fit the data. You may assume curve.

$$y = a + bx + cz$$

**P.T.O.**

- b) The pressure (p) and volume (v) of a gas are related by equation  $PV^w=C$ , where C and W being constants. Fit the equation to the following set of observations. [9]

P	0.5	1	1.5	2	2.5	3
V	1.62	1	0.75	0.62	0.52	0.46

- Q3) a) Use the order of  $h^6$  Romberg integration to evaluate. [10]

$$\int_0^3 xe^{2x} dx$$

- b) Explain Muller's Method. [6]

- Q4) The Redlich – Kwong equation of state is given by [16]

$$P = \frac{RT}{v-b} - \frac{a}{v(v+b)\sqrt{T}}$$

where,

R = the universal gas constant [0.518 kJ/kg K]

T = absolute temperature, K

P = absolute pressure, kPa

v = the volume of a kg of gas,  $m^3/kg$

The parameters “a” and “b” are calculated by,

$$a = 0.427 \frac{R^2 T_c^{2.5}}{P_c}$$

$$b = 0.0866 R \frac{T_c}{P_c}$$

Where  $P_c = 4600$  kPa and  $T_c = 191$  K.

Determine the amount of methane fuel that can be held in a  $3 m^3$  tank at a temperature of  $-40^\circ C$  with a pressure of 65000 kPa. Use a root locating method of your choice to calculate v and then determine the mass of methane contained in tank.

## SECTION - II

**Q5) a)** Following observations wear obtained din pin-fin experiment,

X	0.2	0.4	0.6	0.8	1
Theta	0.81873	0.67032	0.54881	0.44933	0.36787

Where X is ratio of distance measured from the base of the fin and length of the fin, Theta is the temperature difference ratio indicated by thermocouple at that distance x. The conductivity of the fin material is  $K = 130$  units and the cross sectional area of the fin is 0.00023 units. Estimate the rate at which heat is being transferred by the fin which is given by the formula,

$$\text{Heat transferred} = -KA \frac{d(\text{Theta})}{dx} \text{ units}$$

Where  $d(\text{theta})/dx$  is calculated at base of the fin i.e.  $x = 0$ , A is cross sectional area of the fin and K is the conductivity of the fin material. Also calculate theta at the base. Use Newton's Divided Difference Method. [12]

b) What are the Eigen value problems? How are the different from boundary value problems? [4]

**Q6)** Determine the coefficient of the characteristic polynomial of the system. [16]

$$\begin{aligned}(-1 - \lambda)x_1 &= 0 \\ x_1 + (-2 - \lambda)x_2 + 3x_3 &= 0 \\ 2x_2 + (-3 - \lambda)x_3 &= 0\end{aligned}$$

Using the Fadeer – Leverrier Method. Also calculate the Eigen value and their Eigen vectors.

**Q7) a)** Solve the equation. [8]

$$2 \frac{d^2 y}{dx^2} = 3x \frac{dy}{dx} - 9y + 9$$

Subject to the condition  $y(0) = 1$ ,  $y'(0) = -2$

Using Euler's method and compute y for  $x = 0.1$ .

- b) For the case of water draining out from the bottom of a tank, the water level in level in the tank can be given as [8]

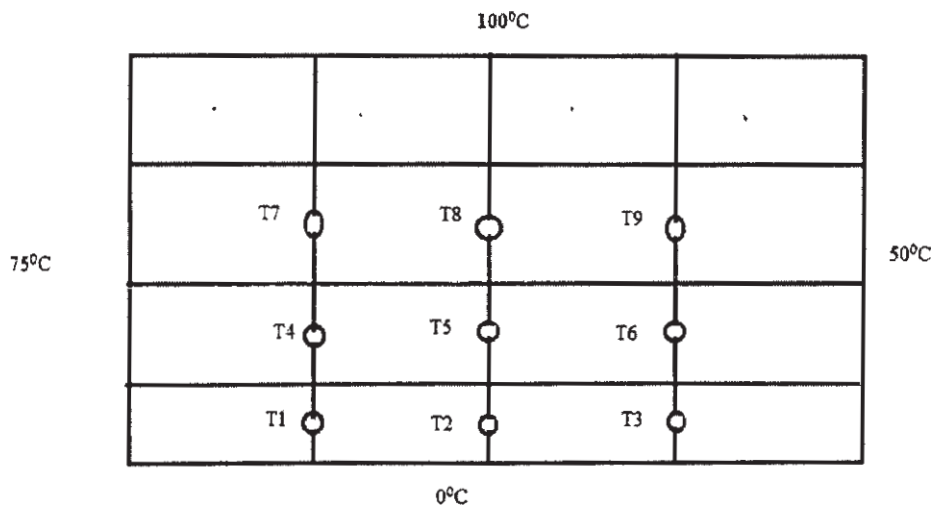
$$\frac{dy}{dx} = -k\sqrt{y}$$

Where  $k = 0.2 \text{ .m}^{1/2}/\text{min}$ .

The initial condition is  $y = 2.5\text{m}$  at  $t = 0$ .

Integrate this from  $t = 0$  to  $t = 2$  min using forward Euler's method with  $\delta t = 0.5$  min and using RK-4 with  $\delta t = 1\text{min}$ .

- Q8)** Use Gauss- Seidel Method for solving Laplace's equation to determine steady state temperature distribution in a heated plate as shown in figure. Employ over relaxation with a value of 1.5 for the weighting factor. Iterate till percentage relative error ( $\epsilon_a$ ) = 45% is satisfied. [18]





Total No. of Questions : 8]

SEAT No. :

P3988

[Total No. of Pages : 3

[4860] - 74

**M.E. (Mechanical) (Heat Power)**  
**ADVANCED THERMODYNAMICS**  
**(2008 Pattern)**

*Time : 3 Hour]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

**SECTION - I**

- Q1)* a) Explain the law of corresponding states with a suitable equation. [4]  
b) What is availability? Define availability function for closed and open system. [4]  
c) Describe generalized compressibility chart and state why it is constructed on the basis of reduced properties. [8]
- Q2)* a) Write notes on : [12]  
i) Law of degradation of Energy.  
ii) Gibbs function and Helmholtz function.  
iii) Isothermal compressibility ( $\alpha$ ) and coeff. of Volume Expansion ( $\beta$ ).

*P.T.O.*

- b) Draw P.T. diagram for the substance. [4]
- i) Which expands on freezing.
  - ii) Which contracts on freezing.
- Q3)** a) Steam expands adiabatically in a turbine from 20 bar and 400 degree to 4 bar 250 degree. Calculate : [8]
- i) Isentropic efficiency of Process.
  - ii) Effectiveness of the process.
  - iii) Loss of availability of the system (surrounding temp - 20 degree)
- b) Derive Expression for availability function of Open System. [8]
- Q4)** Write short notes on (any three) : [18]
- a) Joule - Thompson coeff and inversion curve.
  - b) Triple point and critical point.
  - c) Maxwell relations.
  - d) Enthalpy departure.

## SECTION - II

- Q5)** a) Explain thermal death of universe. [6]
- b) For a single component liquid - vapor system in a state of equilibrium at a specified pressure, if temperature is changed its saturation pressure also changes. Apply the criterion for equilibrium and deduce the clapeyron equation. [10]
- Q6)** a) Write notes on : [10]
- i) Gibb's phase rule.
  - ii) Concept of heat of reaction.
- b) Discuss Amagat's law and Kay's rule. [6]

**Q7)** Write short notes on (any three) : **[18]**

- a) Dalton's law of partial pressure.
- b) Third law of Thermodynamics.
- c) Chemical exergy.
- d) Fugacity and activity.
- e) Bose - Einstein statistics.

**Q8)** a) An insulated chamber is divided into two compartments by a thin partition. Sizes of each compartment are  $(0.125 \text{ m}^3$  and  $0.1 \text{ m}^3$  respectively. Larger compartment contains Oxygen at 350 Kpa and  $40^\circ\text{C}$  while the smaller one contains nitrogen at 700 Kpa and  $100^\circ\text{C}$ . The partition is removed and gases are allowed to mix. **[10]**

Calculate Sp. gas constant,  $C_v$ , and final temp of the mixture.

$C_v$  for oxygen – 0.65 KJ/kg K.

$C_v$  for  $\text{N}_2$  – 0.743 KJ/Kg K.

- b) Explain in brief : **[6]**
- i) Stoichiometric air and stoichiometric coefficients.
  - ii) Enthalpy of formation.



Total No. of Questions : 12]

SEAT No. :

P3989

[Total No. of Pages : 4

[4860] - 75

**M.E. (Mechanical) (Heat Power)**  
**TECHNOLOGY AND FINANCE MANAGEMENT**  
**(Common to Mechatronics and Design Engg.)**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

**UNIT - I**

- Q1)** a) Write difference between short term and long term finance? [8]  
b) Explain in detail sources of finance? [8]

OR

- Q2)** a) What is budget? Explain its types in detail? [8]  
b) Explain importance of capital market? [8]

**UNIT - II**

- Q3)** a) Write difference between fixed and flexible budget? [8]

*P.T.O.*

- b) The company manufactures three products X, Y and Z. The unit selling prices of these products are 120, 170 and 80 respectively. The corresponding unit variable cost are Rs. 50, Rs. 80 and Rs. 30. The proportions in which these products are manufactured and sold are 20%, 30% and 50% respectively. The total fixed costs are 14,00,000. Calculate overall break even quantity and the product wise break up of such quantity. [10]

OR

- Q4)** a) Explain in detail internal sources of finance and growth? [8]
- b) A company has production capacity of 16,000 units and normal capacity utilization is 90%. Opening of finished goods on 1-1-2002 was 1800 units. During the year ending 31-12-2002, it has produced 19,000 units while sold only 13,000 units. The standard variable cost per unit is Rs. 8 and standard fixed factory cost per unit is Rs. 3. The total fixed selling and administration overhead amounted to 13,000. The company sells its product at Rs. 18 per unit. Prepare the income statement under Marginal Costing. [10]

### UNIT - III

- Q5)** a) Write short note on any three : [12]
- i) Importance of economics.
  - ii) Marginal Costing.
  - iii) Types of unemployment.
  - iv) Price elasticity of demand.
- b) What are objectives of foreign trade? Explain foreign trade policy of India? [4]

OR

- Q6)** a) What is need of Engineering Economics? Give comparison between micro and macro economics? [8]
- b) Explain in detail effect of inflation on business and economy. [8]

**SECTION - II**

**UNIT - IV**

- Q7)** a) What do you mean by TQM. Give the detailed importance of Juran trilogy diagram in Quality management. [8]  
b) What is JIT concept? Explain elements of JIT in detail. [8]

OR

- Q8)** a) Explain in detail importance of KAIZEN in Industries. [8]  
b) What is ISO ? Explain importance of ISO 9001-2000 series for industries. [8]

**UNIT - V**

- Q9)** a) Write in detail project life cycle with suitable example? [8]  
b) A project has been defined to contain the following list of activities along with their required times for completion : [10]

Activity No.	Activity	Expected completion time	Dependency
1.	Requirements collection	5	-
2.	Screen design	6	1
3.	Report design	7	1
4.	Database design	2	2, 3
5.	User documentation	6	4
6.	Programming	5	4
7.	Testing	3	6
8.	Installation	1	5, 7

- i) Draw a PERT diagram  
ii) Show critical Path  
iii) Calculate earliest expected completion time

OR

- Q10) a) What are objective and importance of PERT and CPM. [8]**
- b) For a project consisting of several activities, the duration and required resources of carrying out each of the activities and their availabilities are given below : [10]
- i) Draw a neat network, identify critical path and compute total float for each of the activities.
- ii) Find the project completion time under given resource constraints.

Activity	Equipments	Operator	Duration (days)
1 - 2	X	40	5
1 - 3	Y	30	4
1 - 4	Z	30	7
2 - 4	X	40	5
2 - 5	Z	30	9
3 - 4	Y	30	5
3 - 5	Y	30	5
4 - 5	X	40	7

### UNIT - VI

- Q11) a) Write short notes on : [8]**
- i) HR Management
- ii) Role of Manpower planning.
- b) Explain in detail role of Training and Development in organization. [8]

OR

- Q12) a) Explain in detail types of Merit Rating. [8]**
- b) Distinguish between HR and Personal Management. [8]



Total No. of Questions :8]

SEAT No. :

**P4474**

**[4860]-76**

[Total No. of Pages :2

**M.E. (Mechanical - Heat Power Engineering)**

**PERFORMANCE ASSESSMENT OF MECHANICAL EQUIPMENTS**

**(2008 Course) (Semester - I) (Elective - I) (502104-A)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data if necessary and mention it clearly.*

**SECTION -I**

- Q1)** a) Discuss the energy opportunities in the boiler and steam system. [6]  
b) What is steam trap? Explain various types of steam traps. [10]
- Q2)** a) Explain cogeneration systems and its applications. [8]  
b) List various heat exchangers in cogeneration system. Explain any two in details. [8]
- Q3)** a) Define boiler efficiency. With appropriate example explain the direct method of boiler efficiency calculation. [8]  
b) What are the various waste heat qualities? List the waste heat recovery devices used in thermal power plant. [8]
- Q4)** Estimate the thermal efficiency of boiler using indirect method with the following data: [18]

Fuel consumption: 500kg/h

Steam generation rate: 1800kg/h

Calorific value: 41500kJ/kg

Steam generation pressure: 1 MPa at saturated

**P.T.O.**



Chemically correct air-fuel ratio: 15.5:1

Excess air supplied: 26%

Exhaust gas temperature & its specific heat: 300°C & 1.05kJ/kgK

Boiler surface temperature: 60°C

Boiler surface area: 50m<sup>2</sup>

Ambient temperature: 30°C

Feed water temperature: 80°C

Heat transfer coefficient from outer surface of boiler: 8 W/m<sup>2</sup>K

Ultimate analysis of fuel: C = 84%, H = 12%, S = 3%, O<sub>2</sub> = 1%.

You may assume additional data if necessary.

### SECTION -II

- Q5)** a) Explain the step by step procedure of energy performance assessment of DG sets. [8]
- b) Discuss the procedure of performance evaluation of furnace. [8]
- Q6)** a) Define pump efficiency. Explain the procedure for field testing of pump to determine pump efficiency. [8]
- b) List and discuss the energy conservation opportunities in compressed air systems. [8]
- Q7)** a) Give the selection criteria for fans and blowers. [8]
- b) Explain: Heat wheel as a waste heat recovery device. [8]
- Q8)** Explain the followings: [18]
- a) Method to estimate FAD of fans.
- b) Applications of fans in HVAC.
- c) Field testing of Fans.

*EEE*

Total No. of Questions : 8]

SEAT No. :

**P4668**

[Total No. of Pages : 5

[4860]-77

**M.E. (Mechanical) (Heat Power)**  
**REFRIGERATION TECHNOLOGY**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Q. 1 and Q. 5 are compulsory.*
- 2) *Solve any two of the remaining from each section.*
- 3) *Answer to the two sections should be written in separate answer-books.*
- 4) *Draw Diagrams wherever necessary.*
- 5) *Use of scientific calculator is allowed.*
- 6) *Assume suitable data wherever necessary.*

**SECTION - I**

**Q1)** A multi evaporator multi staging, flash intercooler and two compressor vapour compression refrigeration system working with ammonia. The refrigeration capacity of high temperature evaporator operating at  $-20^{\circ}\text{C}$  is 5 TR, while it is 15 TR for the low temperature evaporator operating at  $-40^{\circ}\text{C}$ . The condenser pressure is 10.8 bar. Assuming saturation conditions at the exit of evaporator and condenser. Take gas constant for ammonia as 0.4882 kJ/kgK and isentropic index of 1.29 and isentropic compression. **[18]**

- i) Find the required power input to compressor in kW.
- ii) Find the required power input in kW if instead of using a single compressor and pressure regulating valve, individual compressors are used for low and high temperature evaporators.
- iii) Draw schematic diagram and p-h chart for i) and ii)
- iv) Comment on the results with reference to power input, maximum compressor discharge temperature & volumetric efficiency for i) and ii)

**P.T.O.**

Use the following data :

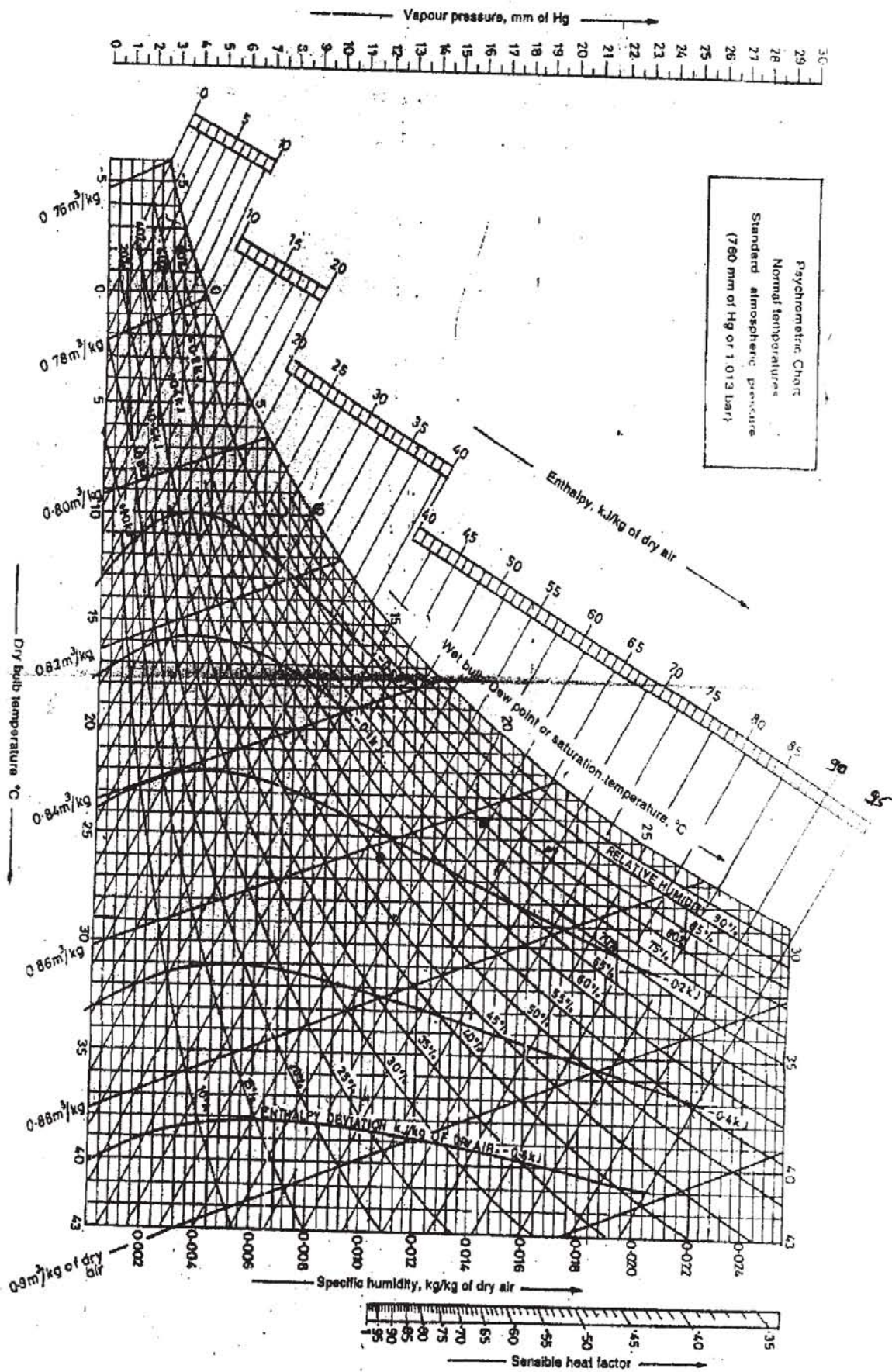
T°C	P <sub>sat</sub> (kPa)	h <sub>f</sub> (kJ/kg)	h <sub>g</sub> (kJ/kg)
-34.4	95.98	44.0	1417
-6.7	331.8	169.1	1455
27.7	1080.0	330.4	1485

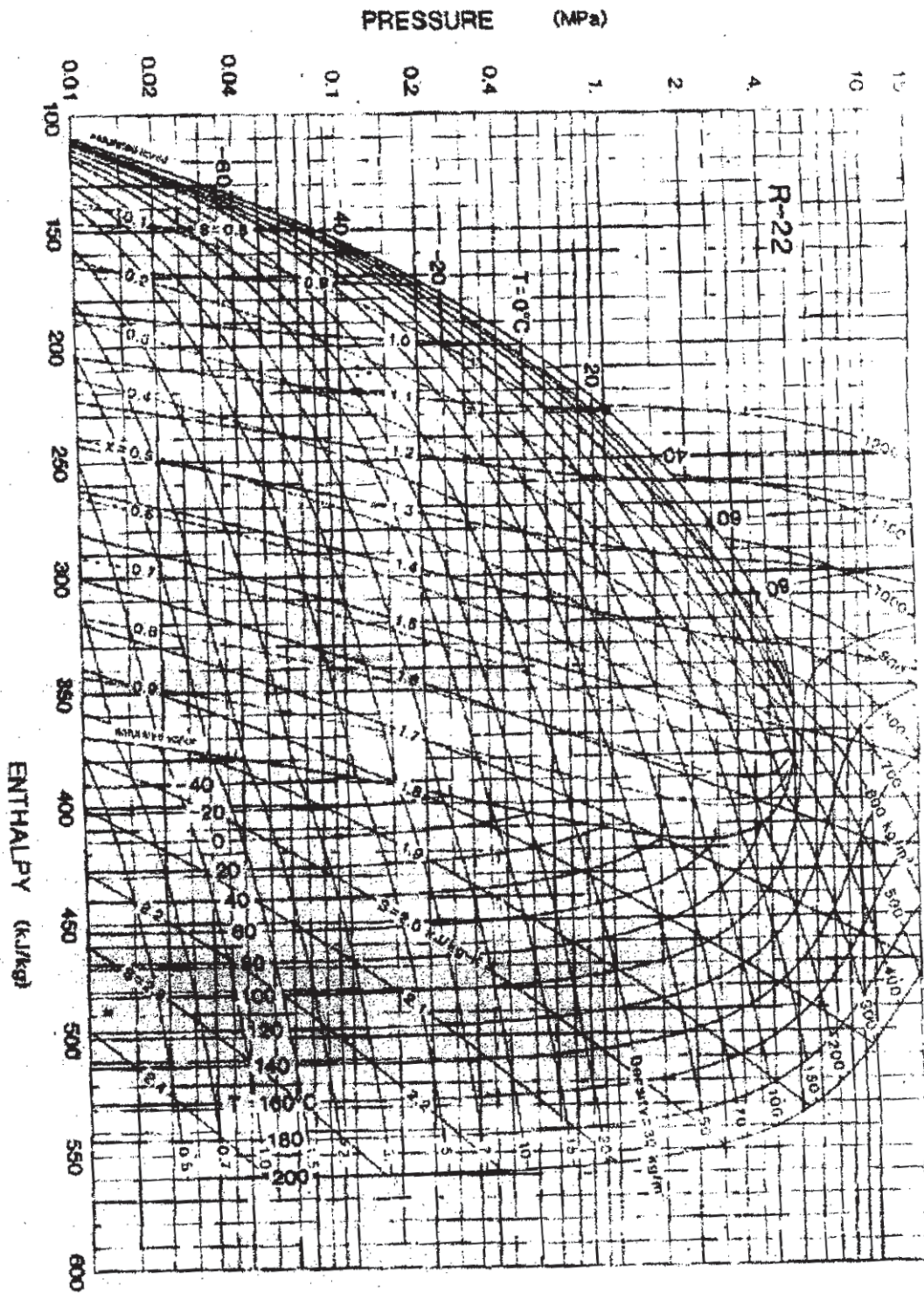
- Q2)** a) Explain refrigerant-lubricant mixture behavior. [5]  
b) Explain the concept of thermo-acoustic refrigeration system with neat sketch. [6]  
c) Write a short note on "Reclaim, Recycle and charging of system". [5]
- Q3)** a) Explain three fluid absorption system with sketch. [6]  
b) Discuss triple effect absorption system with neat schematic. [5]  
c) Explain the concept of magnetic refrigeration system with neat sketch. [5]
- Q4)** a) Discuss the performance characteristics of reciprocating compressor. [5]  
b) Classify compressors and state the steps for selecting compressor for refrigeration system. [6]  
c) What do understand by compressor rating? Explain with suitable example. [5]

## SECTION - II

- Q5)** a) The air enters the coil at a dry bulb temperature of 25°C and a wet bulb temperature of 16°C with a volume flow rate of 140 cmm. The refrigerant is R-22 at a temperature of 4°C that enters with a quality of 0.1 and leaves with 5K superheat. On the airside the heat transfer conductance Ua is 160 W/m<sup>2</sup> and the surface area is 35m<sup>2</sup>. On the waterside the heat transfer conductance Uw is 3100W/m<sup>2</sup> and the area is 1.8 m<sup>2</sup>. [12]  
Determine the performance of a DX.coil in case of  
i) the coil is completely wet  
ii) the coil is completely dry  
Comment on your result. Determine air outlet condition and refrigerant mass flow rate.
- b) Explain the principles of refrigerant piping desing. [6]

- Q6)** a) Explain the selection criteria for condenser and evaporator in refrigeration systems used for cold storage. [10]
- b) Write short note on 'variable speed drive'. [6]
- Q7)** Explain the following : [16]
- a) Thermostat
- b) Flooded evaporator
- c) Automatic expansion valve
- d) Solenoid valves
- Q8)** a) Discuss in brief the various safety controls used in refrigeration system. Explain working of LP and HP cutouts. [8]
- b) With the help of diagram explain the refrigeration system for transport application. [8]





RRRR

Total No. of Questions : 8]

SEAT No. :

P3990

[Total No. of Pages : 2

[4860] - 78

**M.E. (Mechanical) (Heat Power)**

**ENERGY CONSERVATION AND MANAGEMENT**

**(2008 Pattern) (Elective - I(c))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of calculator log tables and electronic calculator is allowed.*

**SECTION - I**

- Q1)** a) Explain current energy consumption pattern in Indian industry. Also state current energy scenario in India and world. [8]
- b) Explain briefly about the energy security and action planning. [8]
- Q2)** a) Explain briefly energy audit methodology. [8]
- b) State energy conservation opportunities in boiler, furnace and HVAC systems. [10]
- Q3)** a) Explain analysis and recommendations of energy audit for process industries. [8]
- b) Calculate the net present value of a project which requires an initial investment of Rs. 2,43,000 and it is expected to generate a cash inflow of Rs. 50,000 each month for 12 months. Assume that the salvage value of project is zero. The target rate of return is 12 % per annum. [8]

**P.T.O.**

- Q4)** a) In a natural gas fired boiler the air to fuel ratio is maintained at  $10\text{Nm}^3/\text{Nm}^3$  of gas. An air preheater is installed to recover the waste heat, which brings down the exit flue gas temperature from  $230^\circ\text{C}$  to  $175^\circ\text{C}$ . If inlet air temperature to air preheater is  $35^\circ\text{C}$ , find out the exit air temperature. Assume that the specific heat of flue gas and ambient air is equal. [8]
- b) Which are the Most Common Problems in condensate recovery? Explain how to prevent them. [8]

## SECTION - II

- Q5)** Explain any three of the following : [18]
- a) Electricity Act 2001.
  - b) Technical aspect of energy motor drives.
  - c) Salient features of load scheduling / shifting.
  - d) Demand control.
- Q6)** a) Explain different features of various types of lamps. [6]
- b) Write a short note on : [10]
- i) Lighting levels
  - ii) Day lighting
- Q7)** a) Explain the energy saving opportunities in heat wheels, recuperators and heat pipes. [8]
- b) Explain energy conservation in pumps using head flow curve. [8]
- Q8)** a) Explain the concept of cogeneration and state need of cogeneration with example. [10]
- b) How to calculate carbon credit? [6]





Total No. of Questions : 8]

SEAT No. :

P3991

[Total No. of Pages : 3

[4860] - 79

**M.E. (Mechanical) (Heat Power)**  
**CONVECTIVE HEAT TRANSFER ANALYSIS**  
**(2008 Pattern) (Elective - I (d))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) 50 kg water heated per min from 30°C to 50°C by passing through a pipe of 20mm dia. The pipe is heated by condensing steam on its surface at 100°C. Find the length of the pipe required. Take the following properties of water at mean film temperature : **[10]**
- $\rho = 965 \text{ kg/m}^3$ ,  $K = 0.585 \text{ w/mK}$ ,  $C_p = 4.2 \text{ kJ/kg k}$ ,  
 $\nu = (0.33 \times 10^{-6}) \text{ m}^2/\text{sec}$ .
- b) Discuss the convection problems in the following applications : **[8]**
- i) House hold refrigerator
  - ii) Boiler.

**P.T.O.**

- Q2)** a) The velocity and temp profile for a laminar flow in a tube of 24 cm diameter is given by  $u = (2.7 r - 3.2 r^2)$  and  $T = 85 (1 - 2.2 r)$ , where  $r$  is measured from the tube surface towards centre. Determine the average velocity and cup mixing temp. [12]
- b) Define Nusselt no & Graetz no. [4]
- Q3)** Write down the governing equation for 2-D, constant fluid property, turbulent boundary layer flow. Explain the concept of eddy viscosity. Explain mixing length theory. [16]
- Q4)** a) Explain the problem of laminar flow with heat transfer in a circular pipe and derive the equation for Nusselt number. [10]
- b) Discuss Reynold and colburn analogy for flow over flat plate. [6]

## SECTION - II

- Q5)** a) Discuss the problem of turbulent flow over flat plate and associated heat transfer problem. [8]
- b) Discuss any four correlations for turbulent flow heat transfer problems. [8]
- Q6)** a) Calculate the heat transfer coefficient by free convection between a horizontal wire and air at 25°C. The surface of the wire is at 95°C and its diameter is 2.5 mm. Also find the maximum admissible current intensity if the resistance of the wire is 6 ohm/m. Use  $\overline{Nu}_D = 1.18(Ra)^{1/8}$  properties of air :  $\gamma = (18.97 \times 10^{-6}) \text{ m}^2/\text{s}$ ;  $Pr = 0.7$ ,  $K = 0.28 \text{ w/mk}$ . [10]
- b) Discuss free convection caused by centrifugal forces. [6]

- Q7)** Write detailed notes on : **[16]**
- a) Combined convection.
  - b) Convective heat transfer through porous media.

- Q8)** Write notes on : **[18]**
- a) Nusselt theory of film condensation.
  - b) Temperature and velocity profiles in free convection on a vertical wall.
  - c) Fully developed and thermally developing flows.



Total No. of Questions : 8]

SEAT No. :

**P3955**

**[4860] - 8**

[Total No. of Pages : 2

**M.E. (Civil) (Construction and Management)**

**RESOURCES MANAGEMENT**

**(2008 Pattern) (Semester - I) (Elective - II(a))**

*Time :4 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Question nos 1 and 5 are compulsory. Out of remaining attempt any two questions from each section.*
- 3) *Answer to the two sections should be written in separate answer books.*
- 4) *Neat diagram must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of calculator is allowed.*
- 7) *Assume suitable data, if necessary.*

**SECTION - I**

**(Material Management)**

- Q1)** a) Explain your role as a Material Manager on a construction site. Also how you will achieve Integrated approach to Material Management. [10]  
b) Write a short note on classification and codification of material of construction. [8]
- Q2)** a) What is ABC analysis? [4]  
b) What are the criteria's for the selection of the source of procurement? [6]  
c) Why standardization in material is necessary? [6]
- Q3)** a) State indices used for assessment of effectiveness of inventory management. How they are helpful while managing the inventory? [10]  
b) Explain the duties of Store manager. [6]
- Q4)** a) How quality control and MMS affects the economy of construction material. [8]  
b) Write a short note on: (any 02) [8]  
i) Role of material manager.  
ii) Stores management.  
iii) JIT.  
iv) EOQ.

***P.T.O.***

## **SECTION - II**

### **(Equipment Management & Human Resources Management)**

- Q5)** a) What are the criteria's for the selection of the Equipment. [8]  
b) Enlist number of equipments for excavation work. Which equipment you will select for the same? Also state factors affecting their selection. [10]
- Q6)** a) How total number of equipments are workout by considering following criteria. [8]  
i) Equipment work cycle.  
ii) Total time available.  
iii) Quantum of work.  
b) Write a short note on: (any 02) [8]  
i) Equipment log book.  
ii) Equipment planning.  
iii) Optimal use of equipment.
- Q7)** a) Explain Need of HRD in context of civil engineering. [8]  
b) How training affects the workforce, quality and productivity of construction? [8]
- Q8)** Write short note on: (any 02) [16]  
a) Human resource management.  
b) Competency Development.  
c) Capacity building at managerial level.



Total No. of Questions : 8]

SEAT No. :

P3992

[Total No. of Pages : 3

[4860] - 80

**M.E. (Mechanical) (Heat Power)**  
**INTERNAL COMBUSTION ENGINES**  
**(2008 Pattern) (Elective - II (a))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) A centrifugal compressor driven by supercharger 4S oil engine. The delivery air does two purposes- first it supplies compressed air to engine and secondly it supplies compressed air to consumers. The air enters the compressor at 20°C and 1 bar and the compressed air before being delivered to engine and consumers it first passes through a cooler where heat at the rate of 1400 kJ/min is rejected. The air leaves at cooler at 60°C and 1.8 bar. The supercharge engine has volumetric efficiency of 0.75 at the condition of 60°C and 1.8 bar. The engine consists of six cylinders having 90 mm bore and 100 mm stroke runs at 2000 rpm and develops 35 kW. Calculate the following if mechanical efficiency is 0.8. **[8]**
- i) The engine indicated mean effective pressure.
  - ii) The air consumption in kg/min in engine.
- b) Explain why the bmep of naturally aspirated diesel engine is lower than that of a naturally aspirated SI engine. **[8]**

**P.T.O.**

**Q2)** a) Enlist the various material use for cylinder head, spark plug, gaskets, cylinder block, piston, piston rings, gudgeon pin, connecting rod, crank shaft. [8]

b) A six cylinders 4S SI engine at 4000 rpm. The bore of each cylinder is 100 mm and stroke is 12 cm. The clearance volume of each cylinder is 100 cc. The fuel consumption is 20kg/hr and torque develop is 150 Nm. Calculate : [8]

i) BP

ii) bmep

iii) brake thermal efficiency

iv) relative efficiency based on brake power.

Assume calorific value of fuel as 43 MJ/kg.

**Q3)** a) Explain MPFI and GDI system for SI Engine. [8]

b) Write short note on electronic control system. [8]

**Q4)** a) Explain the instruments for measuring the following invisible emission. [10]

i) HC

ii) CO

Write their approximate values for SI engine.

b) Explain the importance of Cooling system for improving engine performance. [8]

## SECTION - II

**Q5)** a) Explain reasons for particulates generation in the exhaust of an automobile. [8]

b) Fuel injection systems are replacing carburetors in automobile spark ignition engines. Explain major advantages and any disadvantages of fuel metering with fuel injection relative to carburetion. [8]

- Q6)** a) Explain application of simulation technique for engine manifold design. How it can improve the performance of engine. [8]  
b) What are the causes of NO<sub>x</sub> generation? How are they controlled? [8]

- Q7)** Discuss the effect of load on the following parameters of CI engines. [16]  
a) Mechanical and Brake thermal efficiency.  
b) HR and IHR.  
c) Brake torque of engine.

- Q8)** Write short note on : [18]  
a) Catalytic convertors.  
b) Super chargers.  
c) Principles of combustion chamber designing for CI engines.





Total No. of Questions : 8]

SEAT No. :

P3993

[Total No. of Pages : 3

[4860] - 81

**M.E. (Mechanical - Heat Power)**

**ADVANCED AIR CONDITIONING, HEATING AND VENTILATION**

**(2008 Pattern) (Elective - II(b))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary and mention it clearly.*

**SECTION - I**

**Q1)** a) Air at 10°C DBT and 8°C WBT is supplied at the rate of 15 m<sup>3</sup>/min. It is brought to 20°C DBT and 60% RH by heating and then by adiabatic humidification. [8]

- Find :
- i) Capacity of heating coil in kW.
  - ii) Surface temperature of coil, if bypass factor is 0.3.
  - iii) Capacity of humidifier.

b) With neat schematic explain the working of air washer. Discuss the criteria for air washer selection. [8]

**Q2)** a) Explain all air systems with its merits and demerits over all water systems. [8]

b) In a cooling application moist air enters a refrigeration coil at a rate of 100 kg of dry air per minute at 35°C and 50% RH. The ADP of the coil is 5°C and bypass factor is 0.15. Determine the outlet state of the moist air and cooling capacity of coil in TR. [8]

**P.T.O.**

- Q3)** a) Define and explain the term Bypass Factor and ADP. State advantages and disadvantages of low Bypass Factor. [8]
- b) What are the causes of noise and vibration in air conditioning system? Discuss its elimination techniques. [8]

- Q4)** Write short notes on : [18]
- a) Cooling tower
- b) Significance of ESHF
- c) High velocity systems

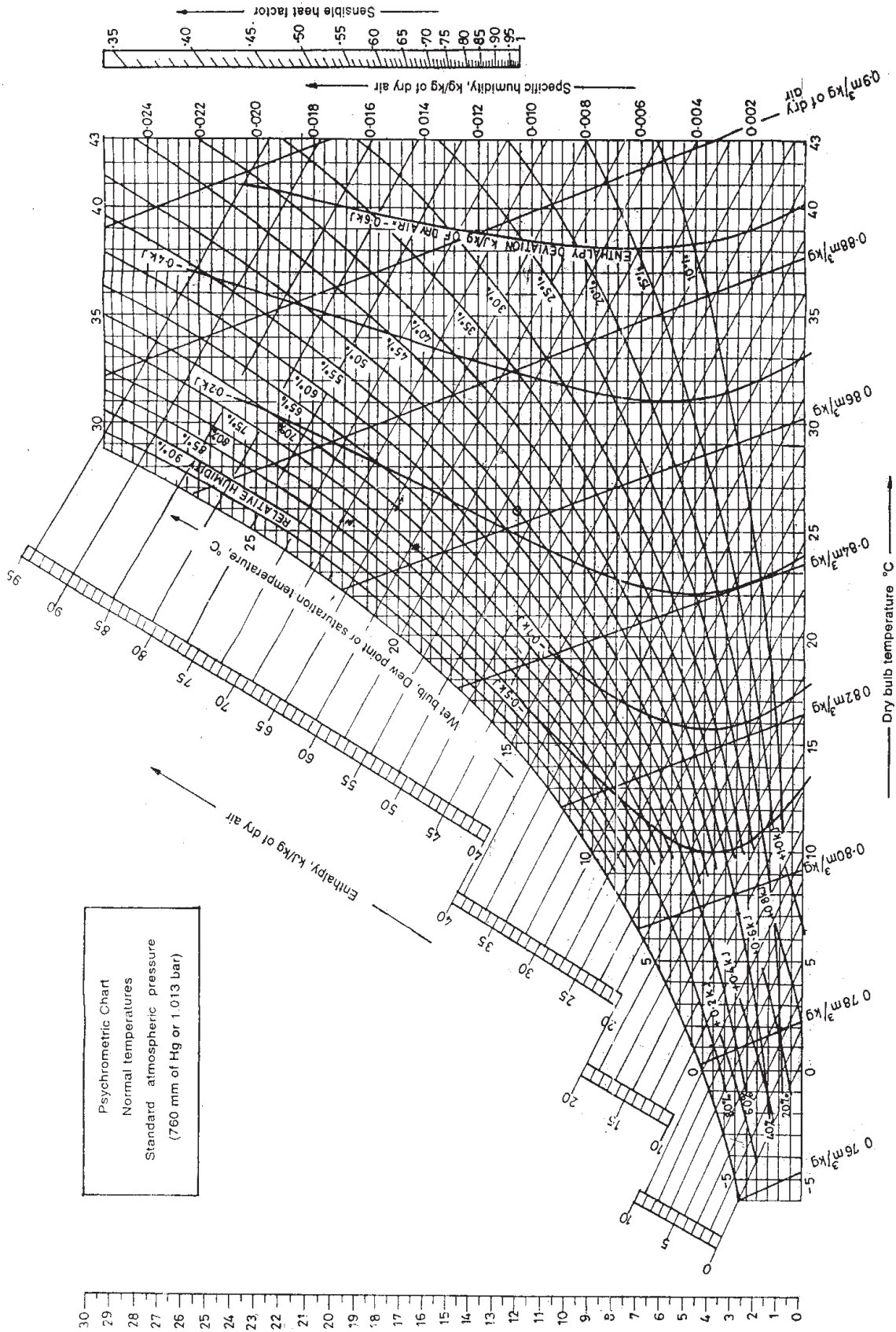
### SECTION - II

- Q5)** a) Discuss the selection criteria for supply and return air outlets in an air conditioning system. [8]
- b) With suitable example explain equal friction method of duct design. How circular duct is converted in equivalent rectangular duct? [8]

- Q6)** a) With neat schematic explain the working indirect evaporative cooling system. What are its advantages and disadvantages over conventional air conditioning system? [8]
- b) What do you mean by ventilation air and infiltration air? Compare natural ventilation with mechanical ventilation. [8]

- Q7)** a) Discuss main features of the BIS standard for testing an unitary air conditioner. [8]
- b) Explain the selection criteria for fan and blower for air conditioning system. [8]

- Q8)** Write short notes on : [18]
- a) Alternative refrigerants for air conditioner.
- b) Railway coach air conditioning.
- c) Air lock, air curtains and air showers.



Total No. of Questions : 8]

SEAT No. :

P3994

[Total No. of Pages : 3

[4860] - 82

**M.E. (Mechanical) (Heat Power) (Semester - I)**

**CONVENTIONAL POWER PLANTS**

**(2008 Pattern) (Elective - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicates full marks.*
- 5) *Use of pocket calculator & different gas charts as applicable is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the modification in the Rankine cycle to improve its efficiency. Draw T-s and schematic Diagram for each case. **[10]**
- b) Steam at 10 bar and 0.95 dry is available. Find the final dryness fraction of steam for each of the following operations using steam table : **[8]**
- i) 160 kJ of heat is removed per kg of steam at constant pressure.
  - ii) It is cooled at constant volume till its temperature falls to 1400 C.
  - iii) Steam expands isentropically in the steam turbine developing 200 KJ of work per kg of steam flow and pressure becomes 0.5bar.
- Q2)** a) What are the factors to be considered while selecting a site for Hydro Electric power plant? **[8]**

**P.T.O.**

- b) Nozzle of impulse stage turbine receives steam at 15 bar and 300 deg. C and discharges it at 10 bar. The nozzle efficiency is 90 % and the nozzle angle is 30 degrees. The blade speed is that required for maximum work and entry of the steam is without shock. The blade exit angle is 5 degrees less than the inlet blade angle. Blade friction factor is 0.9. Calculate the power and efficiency. [8]
- Q3)** a) Write the sources of non-condensable gases in the condenser and effect of these gases on condenser vacuum. Show the arrangement to remove these gases and also derive the expression for vacuum efficiency. [8]
- b) Draw the layout of Diesel power plant. [8]
- Q4)** a) What are the advantages of reheat cycle over simple ranking cycle? [8]
- b) Explain significance of Co-generation and what are the different industries which can benefit from Co-generation? [8]

## SECTION - II

- Q5)** a) Explain use of Load curves in Power plants. [8]
- b) Explain the working of coal handling system used in Power plant. [8]
- Q6)** A steam boiler generates steam at 30bar, 3000 deg C at the rate of 2kg/s. This steam is expanded isentropically in a turbine to a consider pressure of 0.05bar, condensed at constant pressure and pumped back to boiler. [16]
- a) Draw the schematic arrangement of the above plant and T-s diagram of Rankine Cycle.
- b) Find heat supplied in the boiler per hour.
- c) Determine the quality of steam after expansion.
- d) What is the power generated by the turbine?
- e) Estimate the Ranking efficiency considering pump work.

- Q7)** a) Explain the need of Energy storage systems. What are the different techniques to store energy and explain any one method in detail. [10]
- b) What are the different methods used to control super heating of steam. [6]

**Q8)** Write a short note on (any 3) : [18]

- a) Ash handling in thermal power plant.
- b) Nuclear waste disposal.
- c) Cooling towers used in Power plants.
- d) Fluidized bed combustion.
- e) Pollution Control techniques.



Total No. of Questions : 8]

SEAT No. :

P3995

[Total No. of Pages : 4

[4860] - 83

**M.E. (Mechanical) (Heat Power Engineering)**

**ADVANCED GAS DYNAMICS**

**(2008 Pattern) (Elective - II (d))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answers any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of gas table is allowed.*
- 6) *Assume suitable data, if necessary and mention it clearly.*

**SECTION - I**

- Q1)** a) Describe in detail the propagation of wave with respect to Mach number. Draw neat sketches. [6]
- b) Derive an expression : [8]

$$a = \sqrt{\frac{dp}{d\rho}};$$

where a = speed of sound, p = operating pressure and  $\rho$  = density of working fluid.

- c) Explain the phenomena of choking in isentropic flow. [4]
- Q2)** a) Explain adiabatic process using Mollier Diagram. Also explain the fluid properties in adiabatic flow. [8]

**P.T.O.**

- b) A nozzle is required to be design for an exit Mach number of 1.5 with an exit diameter of 200 mm. Find the required ratio of throat area to exit area. The reservoir conditions are given as  $p_o = 1 \text{ atm}$ ;  $T_o = 20^\circ\text{C}$ . Find also the maximum mass flow rate through the nozzle. What will be the exit pressure and temperature? [8]

- Q3)** a) Derive an expression for area variation as shown below for achieving compression and expansion process. [8]

$$\frac{dA}{A} = \left( \frac{1 - M^2}{M^2} \right) \frac{d\rho}{\rho};$$

- b) Explain with neat sketches the fluid flow process that leads to the formation of a shock wave. [8]

- Q4)** a) Show that the Mach number behind the shock is a function of only Mach number after the shock and is given by [10]

$$M_2^2 = \frac{M_1^2 + 2 / (\gamma - 1)}{[2\gamma / (\gamma - 1)]M_1^2 - 1}$$

- b) Explain normal shock using  $h - s$  diagram. [3]  
 c) Explain Detached shock. [3]

## SECTION - II

- Q5)** a) With the help of sketches explain the difference between compression wave and an expansion wave. [8]

- b) Explain in detailed with neat sketches : [10]  
 i) Rayleigh curve  
 ii) Fanno curve



**Q6)** a) A combustion chamber in a gas-turbine plant receives air at 300 K, 55 kPa and 60 m/s. The fuel air ratio is 29 and the calorific value of the fuel is 42 MJ/kg. Assuming  $\gamma = 1.4$  and  $R = 0.287$  kJ/Kg K for the gas, find **[12]**

- i) Mach numbers at inlet and exit.
- ii) Pressure, temperature and velocity of the gas at exit of combustion chamber.
- iii) Percentage loss in stagnation pressure and
- iv) Maximum attainable stagnation temperature.

b) Write short note on re-entry vehicle and physics involved. **[4]**

**Q7)** a) Attempt any Two : **[10]**

- i) Applications and existences of “shock” in real life practice.
- ii) Compressibility factor and its need.
- iii) Over-expanded and under-expanded nozzles.

b) Explain the Prandtl-Myer expansion fan. **[6]**

**Q8)** a) Attempt any two : **[12]**

- i) What is limiting condition for Fanno flow? Derive expression for it.
- ii) Derive Rankine-Hugoniot equation for oblique shock wave.
- iii) Flow phenomena in supersonic wind tunnel.

b) Write a note on Shock tube. **[4]**

**FLOW PROPERTIES DATA**

Isentropic flow table ( $\gamma = 1.4$ )

M	$T/T_0$	$p/p_0$	$\rho/\rho_0$	$A/A^*$	$F/F^*$	$(A/A^*) \cdot (p/p_0)$	$M^*$
0.10	0.99800	0.99303	0.99502	5.8218	4.6236	5.7812	0.10943
0.20	0.99206	0.97250	0.98027	2.9635	2.4004	2.8820	0.21822
0.30	0.98232	0.93947	0.95638	2.0351	1.6979	1.9119	0.32572
1.40	0.71839	0.31424	0.43742	1.1149	1.03458	0.35036	1.2999
1.50	0.68965	0.27240	0.39498	1.1762	1.04870	0.32039	1.3646
1.60	0.66138	0.23257	0.35573	1.2502	1.06348	0.29414	1.4254
1.70	0.63372	0.20259	0.31969	1.3376	1.07851	0.27099	1.4825
1.80	0.60680	0.17404	0.28682	1.4390	1.09352	0.25044	1.5360
1.90	0.58072	0.14924	0.25699	1.5552	1.1083	0.23211	1.5861
2.00	0.55556	0.12780	0.23005	1.6875	1.1227	0.21567	1.6330
2.20	0.50813	0.09352	0.18405	2.0050	1.1500	0.18751	1.7179
2.40	0.46468	0.06840	0.14720	2.4031	1.1751	0.16437	1.7922
2.60	0.42517	0.05012	0.11787	2.8960	1.1978	0.14513	1.8572

Normal Shock table ( $\gamma = 1.4$ )

M	$M_2$	$p_{02}/p_{01}$	$p_2/p_1$	$\rho_2/\rho_1$	$T_2/T_1$	$p_{02}/p_1$	$M_1$
1.30	0.785957	0.979374	1.805000	1.515695	1.190873	2.7135	1.30
1.36	0.757181	0.967579	1.991200	1.620182	1.228998	2.9115	1.36
1.42	0.731436	0.953063	2.185800	1.724303	1.267643	3.1198	1.42
1.48	0.708290	0.936001	2.388800	1.827770	1.306948	3.3382	1.48
1.54	0.687388	0.916624	2.600200	1.930327	1.347026	3.5667	1.54
1.60	0.668437	0.895200	2.820000	2.031746	1.387969	3.8049	1.60
2.00	0.577350	0.720874	4.500000	2.666667	1.687500	5.6405	2.00
2.10	0.561277	0.674203	4.978333	2.811902	1.770450	6.1655	2.10
2.20	0.547056	0.628136	5.480000	2.951220	1.856860	6.7163	2.20
2.30	0.534411	0.583295	6.005000	3.084548	1.946801	7.2937	2.30
2.40	0.523118	0.540144	6.553333	3.211896	2.040332	7.8969	2.40
2.50	0.512989	0.499015	7.125000	3.333333	2.137500	8.5262	2.50
2.60	0.503871	0.460123	7.720000	3.448980	2.238343	9.1813	2.60
2.70	0.495634	0.423590	8.338333	3.558991	2.342892	9.8625	2.70

Rayleigh table ( $\gamma = 1.4$ )

M	$T/T^*$	$p/p^*$	$T_0/T_0^*$	$p_0/p_0^*$	$M^*$
0.10	0.056020	2.366864	0.046777	1.259146	0.10
0.20	0.206612	2.272727	0.173554	1.234596	0.20
0.30	0.408873	2.131439	0.346860	1.198549	0.30
0.40	0.615148	1.960784	0.529027	1.156577	0.40
0.50	0.790123	1.777778	0.691358	1.114053	0.50
0.60	0.916704	1.595745	0.818923	1.075253	0.60
0.70	0.992895	1.423488	0.908499	1.043104	0.70



Total No. of Questions :8]

SEAT No. :

**P4475**

**[4860]-84**

[Total No. of Pages :4

**M.E. (Mechanical - Heat Power Engineering)**

**ADVANCED HEAT TRANSFER**

**(2008 Course) (Semester - II) (502108)**

*Time : 3 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Answer any 3 questions from each section.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Use property tables and scientific calculator is allowed.*
- 5) *Assume suitable data wherever necessary.*
- 6) *Figures to the right indicate full marks.*

**SECTION -I**

**Q1) a)** Explain the following: **[8]**

- i) Variable thermal conductivity.
- ii) Lumped heat capacitance and its validity.

b) Consider the base plate of a 1200 W household iron that has a thickness of  $L = 0.5$  cm, the base area of  $A = 300$  cm<sup>2</sup> and thermal conductivity of  $k = 15$  W/mK. The inner surface of the base plate is subjected to uniform heat flux generated by the resistance heaters inside, and the outer surface loses heat to the surroundings at  $T_{\infty} = 20^{\circ}\text{C}$  by convection. Taking the convection heat transfer coefficient to be  $h = 80$  W/m<sup>2</sup>K and disregarding heat loss by radiation, obtain an expression for the variation of temperature in the base plate and evaluate the temperatures at the inner and the outer surfaces. **[8]**

**Q2) a)** Explain the effect of following on the Efficiency and Effectiveness of Pin Fin. **[6]**

- i) Increase in Fin length.
- ii) Increase in diameter.

**P.T.O.**

- b) The initial uniform temperature of a thick concrete wall ( $\alpha = 1.6 \times 10^{-3} \text{ m}^2/\text{hr}$ ,  $k = 0.94 \text{ W/m}^\circ\text{C}$ ) of a jet engine test cell is  $25^\circ\text{C}$ . The surface temperature of the wall suddenly rises to  $340^\circ\text{C}$  when the combination of exhaust gases from the turbojet and spray of cooling water occurs. Determine: [10]

- i) The temperature at a point 80 mm from the surface after 8 hours,
- ii) The instantaneous heat flow rate at the specified plane and at the surface itself at the instant mentioned at (i)

Use the solution for semi-infinite solid. Given

$z$	$\text{erf}(z)$
0.3	0.3286
0.4	0.4284
0.5	0.5205

- Q3)** a) Explain Reynolds analogy and Chilton-Colburn analogy. [6]
- b) Define and explain the significance of Prandtl number. [4]
- c) Write a note on Passive, Active and Compound heat Transfer Enhancement Techniques. [8]

- Q4)** a) Consider a hot automotive engine, which can be approximated as a 0.5 m high, 0.4 m wide and 0.8 m long rectangular block. The bottom surface of the block is at a temperature of  $100^\circ\text{C}$  and has an emissivity of 0.95. The ambient air is at  $20^\circ\text{C}$  and the road surface is at  $25^\circ\text{C}$ . Determine the rate of heat transfer from the bottom surface of the engine block by convection and radiation as the car travels at a velocity of 80 kmph. [8]

Use:  $\text{Nu} = 0.037 \text{ Re}^{0.8} \text{ Pr}^{1/3}$

Take Properties of air at  $60^\circ\text{C}$  as

$k = 0.02808 \text{ W/m}^\circ\text{C}$ ,  $\nu = 1.896 \times 10^{-5} \text{ m}^2/\text{s}$ ,  $\text{Pr} = 0.7202$

- b) Write short notes (Any two): [8]
- i) Various Boundary Conditions for Heat Transfer Analysis.
  - ii) Velocity and Thermal Boundary layer.
  - iii) Numerical Methods for Fin Analysis.

## SECTION -II

**Q5) a)** Explain the significance of dimensionless numbers used in forced convection. [6]

b) Water flows at the rate of 360kg/hr through a metallic tube of 10mm diameter and 3m length. It enters the tube at 25°C. Outer surface of the tube is maintained at a constant temperature of 100°C. Calculate the exit temperature of the water. Properties of water: [8]

$$\mu = 5.62 \times 10^{-4} \text{ Ns/m}^2; C_p = 4174 \text{ J/kgK}, k = 0.664 \text{ W/mK}.$$

Use the following correlation:

$$\text{Nu} = 0.023\text{Re}^{0.8} \text{Pr}^{0.4} \text{ for turbulent flow}$$

$$\text{Nu} = 3.66 \text{ for laminar flow}$$

c) Explain the importance of characteristic dimension while solving convection problems. [4]

**Q6) a)** Prove that  $L/D = 2.86$  is the relation to decide whether tubes are to be kept horizontal or vertical in a condenser. L is the length and D is the diameter of the tubes to be used in condenser. [8]

b) Write a note on Forced Convection boiling. [8]

**Q7) a)** A furnace of boiler is laid from fire clay brick with outside lagging of plate steel. The distance between the two is quite small compared with the size of the furnace. The brick setting is at an average temperature of 365 K while the steel lagging is at 290 K. Calculate radiation heat transfer per unit area. Assume  $\epsilon_{\text{brick}} = 0.85$  and  $\epsilon_{\text{steel}} = 0.65$ .

What will be the reduction in heat loss if a steel screen having an emissivity value of 0.6 on both the sides is placed between the brick and the steel setting? Also calculate the desired emissivity of the screen if the radiation loss is to be limited to 100 W/m<sup>2</sup>. [10]

- b) The outlet header of a high pressure steam superheater consists of a pipe ( $\epsilon = 0.8$ ) of diameter 27.5 cm. Its surface temperature is  $500^{\circ}\text{C}$ . Calculate the loss of heat per unit length by radiation if it is placed in a large enclosure at  $30^{\circ}\text{C}$ . If the header is now enveloped in a steel screen of diameter 32.5 cm and emissivity 0.7 and the temperature of the screen is  $240^{\circ}\text{C}$ , find the reduction in heat by radiation. [6]

**Q8)** Write note on any two: [16]

- a) Multimode heat transfer.
- b) Cooling load of electronic equipment.
- c) Immersion cooling.
- d) Network method to solve Thermal Radiation problems.

*EEE*

Total No. of Questions : 8]

SEAT No. :

**P4476**

**[4860] -85**

[Total No. of Pages : 2

**M.E. (Mechanical) (Heat Power Engineering)  
MEASUREMENT AND DATA ANALYSIS  
( 2008 Course) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from each section.*
- 2) *Answer to the each section should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Black figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if required.*

**SECTION - I**

**Q1) a)** Explain basic elements of measurement systems and explain in details. [6]

b) Explain following characteristics of measurement. [10]

- i) Precision and Accuracy
- ii) Repeatability and Hysteresis
- iii) Transient response

**Q2) a)** Find a micrometer (a thickness measuring device) of unknown origin and use it to measure the diameter of a steel rod that is known to have a diameter of 0.5000 in. Use the micrometer to make 10 independent measurements of the rod diameter, and the results are 0.4821, 0.4824, 0.4821, 0.4821, 0.4820, 0.4822, 0.4821, 0.4822, 0.4820 and 0.4822. Estimate the systematic error and the maximum random error in these measurements.

[10]

b) Write a note on measurement errors.

[6]

**P.T.O.**

- Q3)** a) Explain working of Heat flux measurement technique. [6]  
b) Explain working of capacitive pressure measurement system. [6]  
c) Write a note on working of load cell. [6]

- Q4)** a) Explain working of tachometer and digital tachometer. [6]  
b) Explain working of optical encoder and its applications. [10]

### SECTION - II

- Q5)** a) What are methods used for pollution control and explain in detail one of them. [10]  
b) Explain working of CO<sub>2</sub> measurement sensor. [6]

- Q6)** a) What is meant by spectrometry and write down its working. [8]  
b) Explain working of mass spectrometry. [8]

- Q7)** a) Explain close loop and open loop control system with example. [8]  
b) Explain working of PID control system and its application in industry. [8]

- Q8)** a) Explain working of servo baed hydraulic control system. [10]  
b) Explain measurement variables need to be measured in Furnace and list down the sensors used. [8]





Total No. of Questions : 8]

SEAT No. :

P3996

[Total No. of Pages : 3

[4860] - 86

**M.E. (Mechanical) (Heat Power)**

**ADVANCED FLUID MECHANICS**

**(2008 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Draw diagrams wherever necessary.*
- 4) *Use of scientific calculator is allowed.*
- 5) *Assume suitable data where ever necessary.*

**SECTION - I**

- Q1)** a) Derive an expression for conservation of mass and momentum using intergral analysis. [10]
- b) Write a short on Vorticity, Velocity Potential and Stream function. [8]
- Q2)** a) Obtain exact solution of flow between two concentric rotating cylinders. [12]
- b) Consider the steady two dimensional, incompressible velocity field,  $\vec{V} = (ax + b)i + (-ay + c)j$ , where a, b, c are constants. Calculate the pressure as a function of x and y. [6]

**P.T.O.**

- Q3)** a) Explain the four simple Potential flows with graphical representations. [8]
- b) The pressure far from an irrotational vortex (a simplified tornado) in the atmosphere is zero gage. If the velocity at  $r = 15$  m is 25 m/s, estimate the velocity and the pressure at  $r = 2$  m. (The irrotational vortex ceases to be a good model for a tornado when  $r$  is small. In the “eye” of the tornado the motion is approximated by rigid-body motion. [8]

- Q4)** a) State the boundary layer theory assumptions. Obtain boundary layer equations in nondimensionalized form. [8]
- b) Using Karman momentum integral equation calculate the local skin friction coefficient  $C_f$  for the following velocity profiles on a flat plate

$$\frac{u}{U_\infty} = 2\eta - 2\eta^3 + \eta^4 \quad \text{Where } \eta = y / \delta . \quad [8]$$

## SECTION - II

- Q5)** a) Derive an expression of friction factor in a smooth pipe for turbulent flow. [8]
- b) Water is flowing through a rough pipe, 400 mm in dia., at the rate of 2.5 m<sup>3</sup>/s. Calculate the power loss in overcoming friction per km length of pipe, if the roughness element height ( $\epsilon$ )= 0.25 mm. Also calculate the maximum velocity. [8]
- Q6)** a) What is a need of turbulence modeling? Discuss various turbulence models. [10]
- b) Heated air at 1 atm and 35°C is to be transported in a 150-m-long circular plastic duct at a rate of 0.35 m<sup>3</sup>/s. If the head loss in the pipe is not to exceed 20 m, determine the minimum diameter of the duct. If friction factor  $f = 0.0180$ . [8]

for laminar flow  $f = \frac{64}{\text{Re}}$

for turbulent flow  $\frac{1}{\sqrt{f}} = 2 \log_{10} \left( \frac{R}{\epsilon} \right) + \frac{2.54}{\text{Re} \sqrt{f}}$

**Q7)** a) Discuss the velocity and pressure variations in flow through Laval Nozzle. [8]

b) An aircraft is flying at a cruising speed of 250 m/s at an altitude of 5000 m where the atmospheric pressure is 54.05 kPa and the ambient air temperature is 255.7 K. The ambient air is first decelerated in a diffuser before it enters the compressor. Assuming both the diffuser and the compressor to be isentropic, determine. [8]

i) the stagnation pressure at the compressor inlet and

ii) the required compressor work per unit mass if the stagnation pressure ratio of the compressor is 8.

**Q8)** a) It is desired to expand air from  $P_0 = 200$  kPa and  $T_0 = 500$  K through a throat to an exit Mach number of 2.5. If the desired mass flow is 3 kg/s, compute. [8]

i) the throat area and the exit

ii) pressure,

iii) temperature,

iv) velocity, and

v) area,

assuming isentropic flow, with  $k = 1.4$ .

b) Discuss the variation of mass flow rate of compressible fluid with pressure ratio. ( $p_2/p_1$ ). [8]



Total No. of Questions : 8]

SEAT No. :

P3997

[Total No. of Pages : 2

[4860] - 87

**M.E. (Mechanical) (Heat Power)**

**INTERNAL COMBUSTION ENGINES FUELS**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain the effect of volatility, antiknock quality, gun deposit, sulphur content in fuel on SI and CI engine. [8]
- b) Discuss the suitability of the Bio gas & Bio Diesel in CI Engine. [8]
- Q2)** a) Explain the basic requirements of a good combustion chamber of CI engine and draw a neat sketch of open combustion chamber. [8]
- b) Explain the phenomenon of pre-ignition. How pre-ignition leads to detonation and vice-versa? Explain how pre-ignition can be detected? [8]
- Q3)** a) Explain fuel rating of CI and SI Engine. [8]
- b) Describe the CI engine combustion on P- $\theta$  graph. [8]

***P.T.O.***

- Q4)** a) What are the potential sources of biodiesel in India? Explain feasibility of it in India. [8]
- b) What are the potential sources engine variables to optimize the combustion in CI engine? [10]

### SECTION - II

- Q5)** a) Compare induction swirl and compression swirl in CI engine. [8]
- b) Explain the stage of combustion in SI engine. [8]
- Q6)** a) Explain the effect of engine variables on knocking for SI Engine. [8]
- b) Explain with neat sketches the different types of turbo charger agreements for power boosting. [8]
- Q7)** a) What are the air-fuel mixture requirements during the following range of operations of SI engine. [8]
- i) idling and no low load.
- ii) normal power range.
- iii) maximum power range.
- b) Explain the limitation of turbocharging for SI engine. [8]
- Q8)** a) Explain the latest trends in CI engine for performance enhancement and emission reduction. [10]
- b) Explain the various methods to control knock in the engine? [8]



Total No. of Questions : 8]

SEAT No. :

P3998

[Total No. of Pages : 2

[4860] - 88

**M.E. (Mechanical) (Heat Power)**

**CRYOGENICS ENGINEERING**

**(2008 Pattern) (Semester - II) (Elective - III)**

*Time : 3 Hour]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams should be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of pocket calculator & different gas charts as applicable is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Define Cryogenics. What is the temperature threshold distinguishing Cryogenics from Refrigeration and Air conditioning. [6]
- b) Explain different applications in the field of Cryogenics. [6]
- c) State boiling points for the gases viz. Helium, Hydrogen, Argon, Nitrogen, Oxygen, Ammonia. [6]
- Q2)** a) Explain Meissner Effect with neat sketch. What are the different applications of Meissner Effect phenomena in present day world. [10]
- b) With neat sketch explain Inversion curve and explain the effect of isenthalpic expansion for positive, negative and zero J-T coefficient. [6]
- Q3)** a) Explain how molecular structure affects the mechanical properties at Cryogenic temperature. [8]
- b) Explain with neat sketch simple Linde Hampson liquefaction system. [8]

***P.T.O.***

- Q4)** a) Explain the construction of Dewar vessel with neat sketch showing all the components and their function. [10]  
b) What are the different performance parameters used in liquefaction systems. [6]

### SECTION - II

- Q5)** a) Explain with neat sketch Stirling Refrigerator. [10]  
b) Explain the difference with neat sketch between Cryogenic Refrigerator system and a Cryogenic Liquefaction system. [6]
- Q6)** a) Explain with neat sketch Cascade refrigerator system. [10]  
b) Explain the construction of Dewar vessel with neat sketch showing all the components and their function. [6]
- Q7)** a) What are the different piping arrangements possible in Dewar Vessel. [6]  
b) Explain different insulations used in the field of Cryogenics in the increasing order of performance. [6]  
c) State different methods /instruments used to measure height of liquid level in Dewar vessel. Explain any one. [6]
- Q8)** a) State the different vacuum pumps used in the field of Cryogenics in the increasing order of vacuum achieved. State the operating range of each of the vacuum pump. Explain any one Vacuum pump with neat sketch. [10]  
b) Explain operating range for different Vacuum gauges. [6]



Total No. of Questions : 8]

SEAT No. :

P3999

[Total No. of Pages : 2

[4860] - 89

**M.E. (Mechanical) (Heat Power Engineering)**

**NON CONVENTIONAL POWER PLANT**

**(2008 Pattern) (Elective - III)**

*Time : 3 Hour]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What is the potential of renewable energy sources in World and India?  
Which is the most commonly used source? [8]
- b) What are the advantages and disadvantages of Thermal solar energy conversion? [8]
- Q2)** a) Explain the effect of following parameters on concentrating collectors. [8]
- i) Inlet temperature of fluid.
  - ii) Mass flow rate.
- b) List various ways by which solar energy can be used to generate power.  
With sketch explain the working of any one type. [8]

**P.T.O.**



- Q3)** a) Write a note on silent features of electricity act 2003. [8]  
b) With neat sketch explain horizontal axis and vertical axis with machines. Write down the problems in operating large wind power generators. [8]

- Q4)** Write notes on : [18]  
a) Energy wheeling and banking.  
b) Economic analysis of a Micro Hydro Power Plant.  
c) Thermal Energy Storage method.

### SECTION - II

- Q5)** a) What are the main components of tidal power plants? Explain with sketch working of a double basin operation. [8]  
b) Distinguish between float and fixed dome type biogas plant. [8]
- Q6)** a) Explain financing mechanisms for non-conventional power plants. [8]  
b) With the help of a neat sketch explain the working of a magneto-hydro power plant. Write the advantages and disadvantages. [8]
- Q7)** a) Write a short note on Applications of fuel cells. [8]  
b) Potential of wind, solar and geothermal energy in India. [8]
- Q8)** Write notes on : [18]  
a) Flash type geothermal power plant.  
b) Social barriers in accepting renewable energy sources in India.



Total No. of Questions : 10]

SEAT No. :

**P3956**

**[4860] - 9**

[Total No. of Pages : 3

**M.E. (Civil) (Construction and Management)**

**TQM IN CONSTRUCTION  
(2008 Pattern) (Elective - II (b))**

*Time :4 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) Solve any 3 questions from each section.*
- 2) Figures to the right indicate full marks.*

**SECTION - I**

- Q1)** a) Explain any 3 definitions of quality with examples from the construction sector. [4]  
b) Differentiate between, with examples, [4]  
i) Process based approach and product based approach  
ii) AQ and QC  
c) Elaborate with examples, need for TQM in the construction industry. [10]
- Q2)** Explain with examples of Construction sector :  
a) Quality Function Deployment (QFD) [4]  
b) Customer delight [3]  
c) Reciprocal supplier relationships [3]  
d) Top management commitment [3]  
e) Employee empowerment [3]
- Q3)** Enlist and explain 8 major reasons for existence of poor quality on construction projects. [16]
- Q4)** Explain any 5 types of construction defects which are classified, with examples from projects. [16]

***P.T.O.***

**Q5)** What is six sigma? How are the sigma levels classified? Determine sigma level of the concreting activity mentioned below :

Sr.No.	Quantity of Concrete cast (m <sup>3</sup> )	Defective work (m <sup>3</sup> )
1	220	95
2	160	25
3	180	35
4	210	120
5	170	45
6	195	80
7	165	30
8	175	85
9	215	55
10	135	48
11	160	32
12	145	40

Suggest measures to improve the quality of the concrete in order to ultimately achieve the sixth sigma level. **[16]**

### **SECTION - II**

**Q6)** Explain 8, ISO 9001:2000 principles in detail as applicable for a contractor's organization. **[16]**

**Q7)** Following Construction defects were noticed on a project

- a) Rebars are severely corroded, from slab.
- b) Toilet slab is leaking significantly.
- c) Flooring level is improper hence water stagnates.

Explain the process of determining the cost of poor quality in each of the above case and justify the approach. **[18]**

**Q8)** Explain the 5 main heads of the PRRT software in detail and show how they are very effective in operational control of a construction project during execution phase. **[16]**

**Q9)** Explain the documentation necessary to achieve an ISO 9001 certification, with the help of formats conventionally adopted by construction organization (Elaborate any 4 formats). **[16]**

**Q10)** Explain the following with examples :

- a) PDCA cycle **[4]**
- b) ERP software **[4]**
- c) Internal customers **[4]**
- d) Benchmarking for quality **[4]**



Total No. of Questions : 8]

SEAT No. :

**P4000**

[Total No. of Pages : 4

**[4860] - 90**

**M.E. (Mechanical Engineering) (Heat Power)**  
**HEAT EXCHANGER SYSTEM DESIGN AND PERFORMANCE**  
**(2008 Pattern) (Elective - IV)**

*Time : 3 Hour]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate answer books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Assume suitable data, if necessary and mention it clearly.*
- 6) Use of steam tables, heat transfer data book, and electronic pocket calculator is allowed.*

**SECTION - I**

- Q1)** a) Explain the heat exchanger design methodology with flowchart. [8]  
b) Outline the step by step thermal hydraulic design procedure for design/performance analysis of brazed plate heat exchanger. [8]
- Q2)** a) What are the various correction (j) factors considered for shell side heat transfer coefficient in Bell Delaware method? [8]  
b) Name the specific exchanger types and explain their construction used in the following applications : [8]
- i) economizer
  - ii) automotive radiator
  - iii) blast furnace air preheating
  - iv) sulfuric acid cooling

***P.T.O.***

**Q3)** City water with a flow rate of 60 kg/s enters a baffled shell-and-tube heat exchanger at 32°C and leaves at 25°C. Heat via be transferred to 140 kg/s of raw water coming from supply at 20°C. Design and estimate constructional parameters of heat exchanger. You may choose a single shell and two tube pass or a single shell and single tube pass. The tube diameter is 19 mm OD and 16 mm ID and tubes are laid out on 25.4 mm sq. pitch. The maximum length of heat exchanger required is of 6 m because of space limitation. Estimate : **[16]**

- i) shell side heat transfer coefficient by Kern method.
- ii) tube side heat transfer coefficient.
- iii) shell side pressure drop
- iv) tube side pressure drop

Assume constant properties. The properties of the fluid at average temperature are :

Properties	Tube side fluid	Shell side fluid
Specific heat, $C_p$ (J/kg K)	4182	4179
Dynamic viscosity, $\mu$ (Pa·s)	$10.02 \times 10^{-4}$	$8.15 \times 10^{-4}$
Thermal conductivity, $k$ (W/m·K)	0.598	0.612
Density, $\rho$ (kg/m <sup>3</sup> )	998.2	996
Prandtl number, Pr	7.01	5.75

**Q4)** Write short notes on (any three) : **[18]**

- a) FIV.
- b) Rod baffles in heat exchanger.
- c) P-NTU method.
- d) Heat pipes.

## SECTION - II

- Q5)** a) Determine the heat transfer surface area required for a heat exchanger constructed from a 25.4mm OD tube to heat helium from  $-7^{\circ}\text{C}$  to  $0^{\circ}\text{C}$  using hot water at  $85^{\circ}\text{C}$ . The water and helium flow rates are 0.6 and 2.4 kg/s. Helium flows within the tubes. The overall heat transfer coefficient is  $120\text{ W/m}^2\text{K}$ . The specific heats for water and helium are 4.18 and 5.20 kJ/kg K, respectively. Consider a 1 – 2 TEMA E exchanger. Solve the problem by both the  $\epsilon$ -NTU and LMTD methods. [12]
- b) Explain the rating and sizing of heat exchangers. [6]

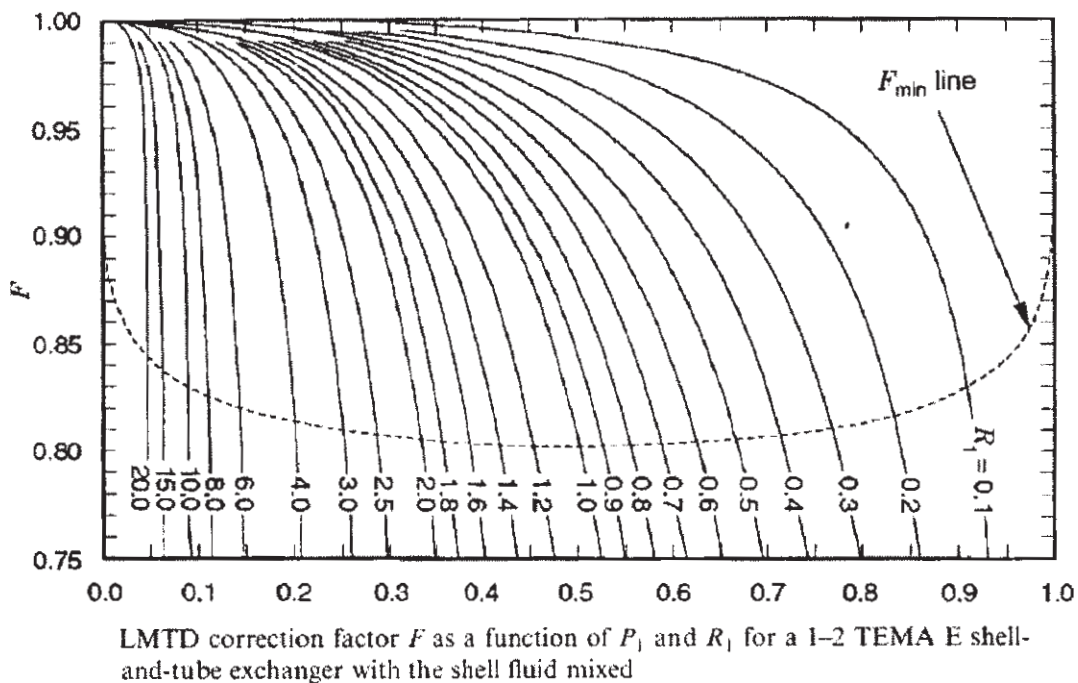


Figure 1 for Q. No. (5)-a

- Q6)** a) Explain : Corrosion and fouling in heat exchangers. [8]
- b) Explain the important aspects of TEMA standards. [8]
- Q7)** a) Explain the selection criteria of heat exchangers based on the following operating parameters. [8]
- Pressure and temperature, material and fluid compatibility, and fluid leakage and contamination.

- b) Explain the importance and physical significance of the followings : [8]  
NTU, LMTD, LMTD correction factor (F), and Heat capacity ratio.

- Q8)** a) Write a note on – Microchannel heat exchanger : [6]  
b) What are various types of regenerators? Explain the regenerator used for power plant. [6]  
c) Discuss the various types of heat exchangers used in refrigeration industry. [6]





Total No. of Questions : 8]

SEAT No. :

**P4676**

[Total No. of Pages : 3

**[4860]-91**

**M.E. (Mechanical) (Heat Power Engineering)**  
**COMPUTATIONAL FLUID DYNAMICS**  
**(2008 Pattern) (Elective - IV (b))**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary and mention it clearly.*

**SECTION - I**

- Q1)** a) State different models of flow using control volume and explain the conservation and non-conservation form of equations. Derive an expression for continuity equation in conservation form using suitable flow model. **[8]**
- b) What are the different types of partial differential equations? Explain each type with one practical example. Explain in detail the mathematical nature of hyperbolic equations. **[8]**
- Q2)** a) Discretize the following equations with suitable approximations. **[8]**
- i) The two dimensional steady state and transient heat conduction equation.
  - ii) The one dimensional transient convection diffusion equation.
- b) Explain CFD analysis process in detail. Write significance of the grid generation in CFD analysis process. **[8]**

**P.T.O.**

**Q3)** a) What is CFL number? Explain the stability criteria for any one numerical scheme. [6]

b) What is adaptive grid? Explain how adaptive grids are generated in any commercial CFD software. [10]

**Q4)** Write a short note on (Any three) : [18]

a) Lax-Wendroff scheme.

b) Finite volume method.

c) Alternating Direction Implicit method.

d) Boundary Conditions.

### SECTION - II

**Q5)** a) Explain MacCormack's technique with predictor and corrector step. [6]

b) Two parallel plates with infinite length are kept 40 mm apart. The fluid within the plates has kinematic viscosity of  $2.17 \times 10^{-4} \text{ m}^2/\text{s}$  and density  $800 \text{ kg/m}^3$ . The lower plate is stationary and the upper plate is moving with velocity 40 m/s. Find the velocity distribution within fluid in y-direction for one time step ( $\Delta t$ ). Discretize the domain with five nodes and apply Crank-Nicolson's implicit method. Take  $\Delta t = 0.55$ . The governing equation is given by [10]

$$\rho \frac{\partial u}{\partial t} = \mu \frac{\partial^2 u}{\partial y^2}$$

**Q6)** a) What are the different types of the grid generation? Explain Delaunay triangulation in detail. Write an algorithm to generate two dimensional unstructured grids. [10]

b) Derive an expression for Couette flow. Explain any one practical example that witness the Couette flow principle. [6]

**Q7)** a) Differentiate between explicit and implicit method. Explain any one explicit method with neat sketches in detail. **[8]**

b) Compute the solution of the first order wave equation with wave speed  $c$  given as below : **[8]**

$$U_t + cU_x = 0, \quad c = \text{constant} > 0$$

Use Lax Wendroff method to find the solution for first two steps. The initial condition given is

$$u(x,0) = (1-x)x, \quad 0 \leq x \leq 1$$

$$u(x,0) = 0, \quad x > 1$$

Boundary condition given is :  $u(0, t) = 0$ , for all  $t$ .

Take  $\Delta x = 0.25$  and  $c \Delta t = 0.0625$

**Q8)** Write a short note on (Any three) : **[18]**

- a) Prandtl-Meyer Expansion wave.
- b) Pressure correction method.
- c) Recent research trends in CFD.
- d) Thomas algorithm.



Total No. of Questions : 10]

SEAT No. :

**P4477**

**[4860] -92**

[Total No. of Pages : 2

**M.E. (Mechanical Engineering) (Heat Power)  
COMPUTERAIDED ENGINEERING (DESIGN)  
(2008 Course) (Semester - II) (Open Elective) (Elective - IV) (502112)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Justify modelling and simulation as a design procedure with simple example. **[8]**
- b) Explain the role of CAE in Thermal system design. **[8]**
- Q2)** a) Enlist different features available in commercial modelling software and explain any one in detail. **[8]**
- b) Explain how to reduce idle time and effective time of modelling and analysis using CAD/CAM/CAE software. **[8]**
- Q3)** a) Differentiate between feature based modelling and constrained based solid modelling techniques. **[8]**
- b) Classify solid modelling techniques and explain in detail hybrid solid modelling. **[8]**

**P.T.O.**

- Q4)** a) Explain different types of grids used in CFD. [8]  
b) Differentiate between static, dynamic and fatigue analysis used in FEA. [8]

- Q5)** Write short note on: [18]  
a) Bottom up assembly modelling approaches.  
b) Numerical methods in FEA.  
c) Analytical techniques for thermal systems.

### SECTION - II

- Q6)** a) What are discretization techniques used in CFD and explain any one in detail. [8]  
b) Describe role of simulation in CAE. [8]

- Q7)** a) Classify 3D meshing techniques of FEA and explain any one in detail. [8]  
b) Explain some of the meshing rules to be followed during meshing. [8]

- Q8)** a) Explain methods to improve quality of poor element. [8]  
b) Explain general procedure for Dynamic Analysis. [8]

- Q9)** a) Differentiate between finite difference and finite volume method of discretization used in CFD. [8]  
b) Explain finite volume method used in CFD and how it is different from FEM. [8]

- Q10)** Write short note on (any three). [18]  
a) Stages of CFD analysis  
b) Basic fluid motions in CFD  
c) Modern developments in grid generation related to CFD.  
d) Uniform and compressed grids used in CFD.



Total No. of Questions : 10]

SEAT No. :

P4001

[Total No. of Pages : 3

[4860] - 93

**M.E. (Mechanical) (Design Engg. & Automotive Engg.)**

**MATHEMATICAL MODELING AND ANALYSIS**

**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) *Questions 1 and 6 are compulsory. Additionally, solve any two questions from the remaining questions in section - I and any two questions from the remaining questions in section - II.*
- 2) *Answers to each sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data wherever necessary but mention it clearly.*
- 5) *Use of scientific calculator is allowed.*

**SECTION - I**

- Q1)** a) Linearize the function  $f(x) = 5\cos x$  about  $x = \pi/2$ . [7]
- b) Linearize the differential equation  $d^2\theta/dt^2 = -(g/L)\sin\theta$  about  $\theta = 0$ , where  $g$  and  $L$  are constants. [7]
- c) What is a signal flow graph, explain. [4]
- Q2)** Explain the following : [16]
- a) Continuous-time system.
  - b) Discrete-time system.
  - c) Time-varying system.
  - d) Time-invariant system.
- Q3)** Write the governing equations for a fluid system (assuming incompressible flow) in differential form and explain the various terms in them. [16]

**P.T.O.**

Q4) Draw linear graphs for the systems shown in Figure 1.

[16]

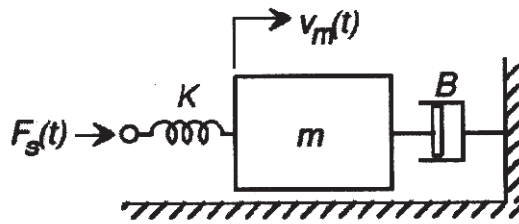


Figure 1a

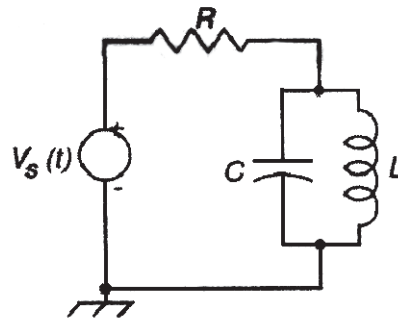


Figure 1b

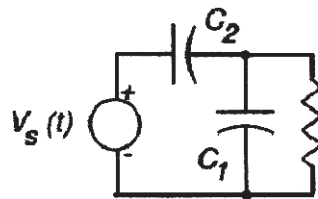


Figure 1c

Q5) Given two continuous time signals  $x(t)$  and  $g(t)$  as

[16]

$$x(t) = \begin{cases} 0, & t < 0 \\ t/3, & 0 \leq t \leq 3 \\ 0, & t > 3 \end{cases} \quad g(t) = \begin{cases} 0, & t < -1 \\ 1, & -1 \leq t \leq 1 \\ 0, & t > 1 \end{cases}$$

compute the convolute integrals.

### SECTION - II

Q6) a) Discretize the Laplace equation  $\partial^2 u / \partial x^2 + \partial^2 u / \partial y^2 = 0$  using finite difference method. [12]

b) Explain the following terms with respect to the finite difference method. [6]

- i) Truncation error
- ii) Convergence

**Q7)** The heat equation that determines the one-dimensional temperature distribution  $T(x, t)$  on a plane  $x = \text{constant}$  at time  $t$  in a block of metal with heat conduction properties characterized by the constant  $\alpha$  (*i.e., thermal diffusivity*) is given by **[16]**

$$\frac{\partial^2 T}{\partial x^2} = \frac{1}{\alpha} \frac{\partial T}{\partial t}$$

Write the Laplace Transform solution of this equation, considering the metal slab to be semi-infinite. Consider the situation where for  $t < 0$  all of the metal in the slab is at the temperature  $T = 0$  and then, at time  $t = 0$ , the plane face of the slab at  $x = 0$  is suddenly brought up to and maintained at the constant temperature  $T = T_0$ . The problem is to find the temperature inside the slab on any plane  $x = \text{constant}$  at any time  $t > 0$ , knowing that physically the temperature must remain finite for all  $x > 0$  and  $t > 0$ .

**Q8)** a) Determine the Fourier transform of a periodic function. **[12]**

$$f(t) = \sum_{n=-\infty}^{\infty} \delta(t - nT)$$

b) Explain the term modulation. **[4]**

**Q9)** Determine z transforms of the following signals : **[16]**

a)  $x(m) = 1$  for  $m = 0$  and  $x(m) = 0$  for  $m \neq 0$ .

b)  $x(m) = 1$  for  $m = k$  and  $x(m) = 0$  for  $m \neq k$ .

c)  $x(m) = \alpha^m$  for  $m \geq 0$  and  $x(m) = 0$  for  $m < 0$ .

**Q10)** Explain the following simulation methods : **[16]**

a) Digital,

b) Analogue,

c) Analytic, and

d) Monte-Carlo





[4860] - 94

**M.E. (Mechanical) (Design Engineering)****ADVANCED STRESS ANALYSIS****(2008 Pattern) (Semester - I)***Time : 3 Hours]**[Max. Marks : 100**Instructions to the candidates :*

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Show that the Airy stress function  $\Phi = 2x_1^4 + 12x_1^2 x_2^2 - 6x_2^4$  satisfies the bi-harmonic equation  $\nabla^4 = 0$  and determine the stress components assuming plain strain. [8]
- b) What is the significance of compatibility conditions? Derive compatibility equation by using polar-co-ordinate system. [8]
- Q2)** a) A thin walled box section of dimensions '2a × a × t' is to be compared with a solid section of diameter 'a' as shown in fig.1. Find the thickness 't' so that the two sections have [10]
- i) The same maximum stress for the same torque.
  - ii) The same stiffness.

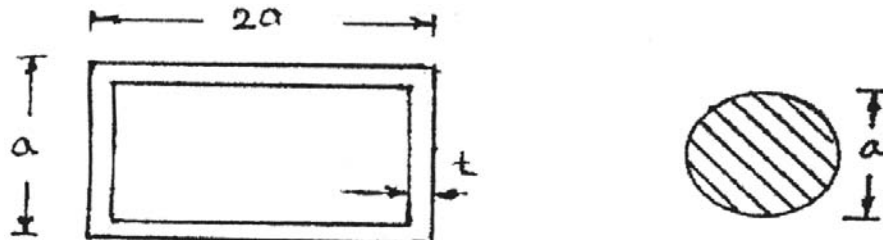


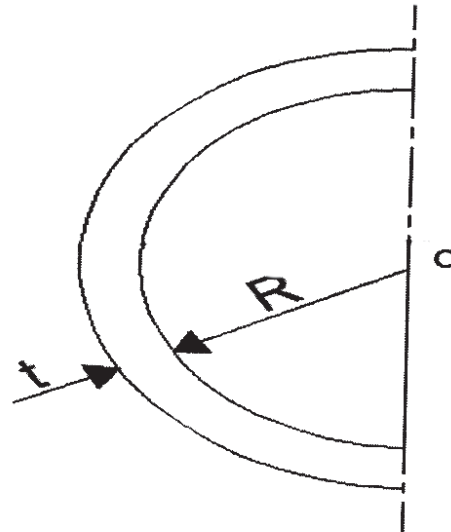
Fig.1

- b) Compare Kelvin's fluid - flow analogy with Prandtl's membrane analogy. [6]
- Q3)** a) Derive from fundamentals the expression for contact stresses between two spherical bodies of radii  $R_1$  &  $R_2$  under compressive load  $P$ . State the assumptions made. [10]
- b) Analyze contact stresses between eccentric cam and flat follower. [6]
- Q4)** Determine the intensities of principal stresses in flat steel disc of uniform thickness having a diameter 1 m and rotating at 2400 rpm. What will be the stresses if the disc has central hole of 0.2 m diameter? Take Poisson's ratio = 0.333 and density ( $\rho$ ) 7850 kg/m<sup>3</sup>. [16]
- Q5)** Write short notes on any three : [18]
- a) Torsion of conical shaft
- b) Theorem of least work
- c) Bending of circular plate
- d) Elastic Behaviour of anisotropic materials like reinforced composites.

## SECTION - II

- Q6)** a) A fringe order of 2.5 was observed at a point in a stressed plane stress model with light having a wavelength of 589 nm. Assuming that stress optic coefficient 'C' remains constant, what fringe order would be observed at the point considered when light with wavelength of 548 nm is used? Derive the formula used. Explain in details desirable properties of strain gauge material. [10]
- b) Explain in details desirable properties of strain gauge material. [6]

**Q7)** Explain the importance of bending axis and shear centre for thin walled section elements. Locate the shear centre for section as shown in Fig.2.[16]



**Fig.2**

**Q8) a)** Derive an equation for stress distribution in shrink fitted compound cylinders with usual notations. [8]

b) A cylinder of 150 mm internal diameter is subjected to an internal pressure of 50 MPa. The material for the cylinder has permissible stress of 120 MPa in simple tension with modulus of elasticity 200 GPa and Poisson's ratio is 0.3. Neglecting the longitudinal stress, calculate required thickness of the cylinder on the basis of [8]

i) Maximum Principal Stress.

ii) Maximum Principal Strain.

**Q9) a)** Laminate of composite material has a fracture toughness of 30 MPa m<sup>1/2</sup> and tensile strength of 500 MPa. A 25 mm width(b) structure made up of this material has edge crack(a) of length 3 mm. Find the critical stress that would cause unstable propagation of the crack. For this geometry of the specimen the stress intensity factor is [8]

$$k1 = \sigma \sqrt{\pi a} f\left(\frac{a}{b}\right)$$

$$\text{where } f\left(\frac{a}{b}\right) = 1.12 - 0.231\left(\frac{a}{b}\right) + 10.55\left(\frac{a}{b}\right)^2,$$

a = crack length and b = plate width.

- b) Explain the fracture mechanics approach for estimation of residual life of a component. What is critical stress intensity factor? How it is useful in design of cracked components? [8]

*Q10)* Write short notes on any three : [18]

- a) Modes of fractures.
- b) Strain gauge rosette.
- c) Analysis of low speed impact
- d) Bending of long uniformly loaded rectangular plate.



Total No. of Questions : 9]

SEAT No. :

**P4478**

**[4860] -96**

[Total No. of Pages : 2

**M.E. (Mechanical Engineering-Design Engineering)  
a-INSTRUMENTATION AND AUTOMATIC CONTROL  
( 2008 Course) (Semester-I) (Elective- I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Answer three questions from each section.*
- 2) *Answer to the each section should be written in separate books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if required.*

**SECTION - I**

- Q1) a)** Give step by step procedure for measurement of any quantity with appropriate example. **[6]**
- b) List down the static and dynamic characteristics of measuring instruments and explain at least two characteristics in detail. **[10]**

- Q2) a)** Growth of bacteria (N) in a culture after t hrs. is given in following table:

T	0	1	2	3	4	5	6
N	32	47	65	92	132	190	275

- Fit a curve of the form  $N=ab^t$  and estimate N when  $t=4.5$  **[6]**
- b) What is meant by Least Square Regression Method, Derive the relation for linear equation fit using least square approach? **[6]**
- c) List down the errors involved in measurement and explain these errors in detail. **[6]**

- Q3) a)** Explain method to measurement the field quantities (i) Heat Flux measurement (ii) Flow Measurement. **[10]**
- b) Explain working principle of measurement of temperature using Resistance Temperature Detector. **[6]**

**P.T.O.**

**Q4)** Write a short note on following (Attempt any three). **[16]**

- a) Accelerometer and Vibration Measurement.
- b) Noise Measurement
- c) Anemometer.
- d) Load Cell.

**SECTION - II**

**Q5)** a) Explain working principle of Torque Dynamometer (Rope wire type). **[6]**  
b) List down methods used for radiation measurements and explain one of them in detail. **[10]**

**Q6)** a) What is pollution and explain its significance in terms of industrial development. **[8]**  
b) List down the pollution measurement techniques and explain oxygen measurement sensor. **[8]**

**Q7)** a) What is meant by Mass Spectrometry and explain working of spectrometer. **[8]**  
b) List down methods used for pollution control explain one of them in detail. **[8]**

**Q8)** a) What is close loop and open loop control? Give appropriate examples for open loop and close loop control systems. **[8]**  
b) Explain working of PID PD and PI control system and its importance for industrial process control. **[8]**

**Q9)** Write note on following attempts any three. **[18]**

- a) Pneumatic controls in industry.
- b) Electronic controls used in process industries.
- c) List down different control systems used in material handling systems.
- d) Chromatography.



Total No. of Questions : 10]

SEAT No. :

**P4003**

[Total No. of Pages : 2

**[4860] - 97**

**M.E. (Mechanical) (Design Engineering)**

**ADVANCED MATERIAL SCIENCE**

**(2008 Pattern) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) Answer any 03 questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) List important micro-constituents of Fe-C system and Explain their mechanical properties. Draw neat Fe-C Diagram showing all details. [8]
- b) What is co-ordination number? How it is useful to decide lattice structure? What is physical significance in metallic structure? [8]
- Q2)** a) Explain the various methods to achieve high strength in HSLA steels. [8]
- b) Explain the method used for hardening non ferrous alloys. [8]
- Q3)** a) What do you mean by Atomic packing factor? Explain the packing of atoms to form simple cubic, Body centered Cubic, FCC and HCP. [8]
- b) List and sketch five possible Bravais lattices in two dimensions. What is Schottky and Frenkel defect? [8]
- Q4)** a) Explain the age hardening with the help of typical equilibrium diagram? How it is achieved in non ferrous materials? [8]
- b) Explain spheroidizing annealing process used in heat treatment of tool steel. [8]

***P.T.O.***

- Q5)** Write a note on following (Any Three) : **[18]**
- a) Cu-Al alloys
  - b) Dual phased steel
  - c) Creep resistant materials
  - d) Inconels and Haste alloys.

**SECTION - II**

- Q6)** a) Discuss mechanical, chemical, physical and biological requirements of orthopedic biomaterials.? **[8]**
- b) What is super conducting materials? How they are produced? What are its applications. **[8]**
- Q7)** a) Explain how the volume of the fibre, fiber orientation and fiber strength are related to each other? **[8]**
- b) Determine the use of cermets in cutting tools for machining. **[8]**
- Q8)** a) Explain IVD ion implantation method. **[8]**
- b) Explain vacuum based coating methods to reduce the friction. **[8]**
- Q9)** a) Explain the meaning of the following terms : **[8]**  
Ceramics, inorganic glass, glass-ceramics, cermets. Explain why ceramics typically are processed as powders. How is this similar or different from the processing of metals? **[8]**
- b) What is PVD? Explain the process in detail mentioning its advantages, limitations, and applications. **[8]**
- Q10)** Write a note on (Any Three) : **[18]**
- a) Shape Memory Alloys.
  - b) Prosthetic materials.
  - c) Sports materials.
  - d) CVD.





Total No. of Questions : 8]

SEAT No. :

**P4671**

[Total No. of Pages : 3

**[4860] - 98**

**M.E. (Mechanical) (Design Engineering)**  
**OPTIMIZATION TECHNIQUES (Elective - I(C))**  
**(Semester - I) (2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:-*

- 1) *Attempt any 3 questions from each section.*
- 2) *Answer to each section must be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of pocket calculator is allowed.*
- 6) *Assume suitable data wherever necessary.*

**SECTION - I**

**Q1) a)** What is the difference between linear programming and non linear programming? **[4]**

- b) A retail store stocks and sells three different models of TV sets. The store cannot afford to have an inventory worth more than Rs. 4,50,000 at any time. The TV sets are ordered in lots. It costs Rs.  $a_j$  for the store whenever a lot of TV model  $j$  is ordered. The cost of one TV set of model  $j$  is  $c_j$ . The demand rate of TV model  $j$  is  $d_j$  units per year. The rate at which the inventory costs accumulate is known to be proportional to the investment in inventory at any time, with  $q_j = 0.5$ , denoting the constant of proportionality for TV model  $j$ . Each TV set occupies an area of  $s_j = 0.40\text{m}^2$  and the maximum storage space available is  $90\text{m}^2$ . The data known from the past experience are given below. **[12]**

	TV model $j$		
	$j = 1$	$j = 2$	$j = 3$
Ordering cost, $a_j$ (Rs.)	50	80	100
Unit cost, $c_j$ (Rs.)	40	120	80
Demand rate, $d_j$	800	400	1200

Formulate the problem of minimizing the average annual cost of ordering and storing the TV sets.

**P.T.O.**

- Q2) a)** What is the difference between a simplex method and simplex algorithm? [4]  
**b)** Find all the basic solutions corresponding to system of equations by pivotal reduction method [12]

$$2x_1 + 3x_2 - 2x_3 - 7x_4 = 1$$

$$x_1 + x_2 + x_3 + 3x_4 = 6$$

$$x_1 - x_2 + x_3 + 5x_4 = 4$$

- Q3) a)** What is convex set and nonconvex sets? [4]  
**b)** Solve below problem using simplex method [12]

$$\text{Maximize } f = -100x_1 + 50x_2$$

Subject to constraints

$$400x_1 - 200x_2 \leq 25000$$

$$20x_1 + 30x_2 \leq 9000$$

$$20x_1 + 30x_2 \leq 9000$$

$$x_1 \geq 0$$

$$x_2 \geq 0$$

- Q4) a)** Minimize  $f(x) = (200 - 2x^2)$  over the interval  $60 \leq x \leq 150$  by half interval method. [8]

- b)** Minimize  $f(x_1, x_2) = 2x_1 - 2x_2 + 4x_1^2 + 4x_1x_2 + 2x_2^2$

starting from point  $x_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$  by using conjugate gradient method. [10]

### SECTION - II

- Q5) a)** Find minimization of the function [8]

$$F(\lambda) = 0.65 - 0.75 / (1 + \lambda^2) - 0.65 \lambda \tan^{-1} 1/\lambda$$

Using Newton method with starting point

$$\lambda_1 = 0.1; \text{ Use } \varepsilon = 0.01$$

- b)** Minimize  $f(x) = 0.1x_1 + 0.05773x_2$  [8]

Subject to

$$G_1(x) = \frac{0.6}{x_1} + \frac{0.3464}{x_2} - 0.1 \leq 0$$

$$G_2(x) = 6 - x_1 \leq 0$$

$$G_3(x) = 7 - x_2 \leq 0$$

Solve using sequential quadratic programming method.

**Q6) a)** Minimize  $f(x_1, x_2, x_3) = (x_1 - x_2)^2 + (x_2 - x_3)^4$  [12]

Subject to

$$G_1(x) = 2x_1(1 + x_2^2) + 2x_3^4 - 6 = 0$$

$$-3 \leq x_1 \leq 3, l = 1, 2, 3$$

Using Generalized Reduced Gradient method

**b)** Write a short note on [6]

i) Penalty function method

ii) Conjugate gradient method

**Q7) a)** What is a Lagrange multiplier? What is the significance of a Lagrange multiplier? Give examples for interpretation of a Lagrange multiplier.

b) What is basic and non basic variables? Give example

c) What is feasible and infeasible region? Give example

d) What is unbounded and bounded feasible region? Give example.

[16]

**Q8)** Minimize  $f(x_1, x_2) = x_1^2 + x_2^2 - 2x_1 - 2x_2 + 2$  subject to  $g_1 = -2x_1 - x_2 + 4 \leq 0$ ,  
 $g_2 = -x_1 - 2x_2 + 4 \leq 0$ .

Minimize  $f(x_1, x_2)$  using Kuhn-Tucker conditions.

[16]



Total No. of Questions : 10]

SEAT No. :

**P4004**

[Total No. of Pages : 2

**[4860] - 99**

**M.E. (Mechanical) (Design Engineering)**  
**MATERIAL HANDLING EQUIPMENT DESIGN**  
**(2008 Pattern) (Elective - II)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates :*

- 1) Answer any three questions from each section.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of electronic pocket calculator is allowed.*
- 6) Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) What is material handling system? Write its objective and benefits. [8]  
b) Write note on classification of material handling equipments? [8]
- Q2)** a) Define various terminologies in material handling system? Write its significance? [8]  
b) Discuss the principle and features of material handling system? [8]
- Q3)** a) Write in detail packing and storage material? [8]  
b) Explain in detail material handling equation. [10]
- Q4)** a) What are factors affecting on selection material handling equipments? [8]  
b) Discuss in detail travelling mechanism for cantilever crane? [8]

***P.T.O.***

- Q5)** a) Write short note on any two : [10]  
i) Drives for hosting  
ii) Hoisting mechanism  
iii) Electrically driven EOT  
b) Write in detail application of material handling equipments. [6]

**SECTION - II**

- Q6)** a) Distinguish between chain and ropes. [8]  
b) Explain in detail Grab buckets. [8]
- Q7)** a) What is rope? Explain its types in detail. [8]  
b) Explain in detail load chain. [8]
- Q8)** a) What is belt conveyer? Explain it in detail? [8]  
b) Distinguish screw conveyer and cabin conveyer. [8]
- Q9)** a) Explain in detail objective of storage system. [8]  
b) What is concept of bulk material handling? [10]
- Q10)** a) Write short notes on : [8]  
i) Safety and design in material handling.  
ii) Safety regulations.  
b) Explain in role of warehouse automation in industry. [8]

