

Total No. of Questions : 6]

SEAT No. :

P4876

[Total No. of Pages : 2

[5155] - 2

M.E. (Civil Structure)

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(2008 Pattern)

Time :3 hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Attempt any two questions from each section.*
- 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.*
- 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 earthquake? What is the philosophy behind earthquake resistant design of structure? **[9]**

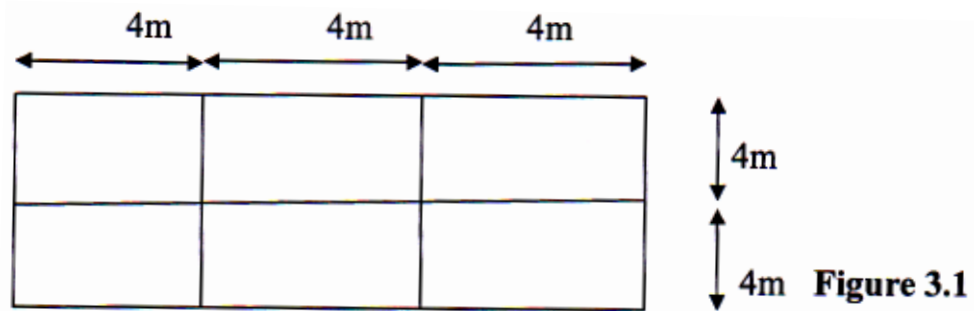
c) Describe measurement of ground motion during earthquake? **[10]**

Q2) Write notes on **[25]**

- a) Strong ground motion
- b) Soil structure interaction
- c) Plate tectonic theory
- d) Tuned Mass Dampers

Q3) The plan for Five storey hospital building is shown in figure 3.1 Assuming OMRF construction in zone III and medium stiff soil, determine seismic loads in Y - direction on structure. Take D.L. = 10KN/m², LL = 3kN/m² and floor height 3.2 m. **[25]**

P.T.O.



SECTION - II

- Q4)** a) What is the necessity of ductile detailing? Explain with neat sketches the detailing for flexural member as per IS 13920(1993). [10]
- b) What is liquefaction of soil? Explain the effects and various methods to reduce the effects of liquefaction? [15]
- Q5)** a) Define the shear wall and its classification? Describe the structural behavior of shear wall? [10]
- b) What is Base Isolation? Explain energy dissipation devices to improve earthquake resistance of buildings? [15]
- Q6)** a) What is strengthening and retrofitting? Explain in brief the techniques for retrofitting of traditionally build constructions? [10]
- b) Explain the terms active and passive control system? What are different types of steel frames used in earthquake prone areas. [15]



Total No. of Questions : 6]

SEAT No. :

P4877

[Total No. of Pages : 2

[5155] - 3

M.E. (Civil Structures)

BIO MECHANICS AND BIO MATERIALS

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

Time :3 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 indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain Kinetics and Kinematics in the study of Biomechanics with suitable example. [8]
- b) Explain various elastic models applicable biological tissue. Draw suitable diagram to illustrate, illustrate its suitability to type o tissue. [9]
- c) Explain importance and applications of study of Biomechanics. [8]
- Q2)** a) Explain Bio compatibility of material and List bio compatible materials used as replacement material to biological organ. Illustrate your answer with suitable application. [8]
- b) List the mechanical properties of bio compatible materials used for replacement prosthesis. [9]
- c) Explain equilibrium of Hip joint. [8]
- Q3)** a) Explain bone cement, explain its functioning as biomaterial. [8]
- b) Explain silicon rubber, UHMWPE, ultra - high molecular weight poly ethylene as biocompatible material. [9]
- c) Explain properties of stainless steel, cobalt base alloys, and Titanium base alloys when used as prosthesis material. [8]

P.T.O.

SECTION - II

- Q4)** a) Explain with sketch structure of bone tissue. [9]
b) Sketch geometry of the articulating joint for Knee joint, and write its equilibrium equation. [9]
c) Explain experimental measurement of wear of cartilage on cartilage material. [7]
- Q5)** a) Explain with sketch, the term 'Gait analysis'. [8]
b) Explain various measurement techniques for body motion. [9]
c) How gait analysis helps in various applications of Biomechanics study. [8]
- Q6)** a) Explain dental prosthesis. [8]
b) Explain steps in structural design of a fixation device like hip or knee joint. [9]
c) What is the classification of prosthetics devices? Enlist prosthetics useful for human use. [8]



Total No. of Questions : 6]

SEAT No. :

P4878

[Total No. of Pages : 2

[5155] - 4
M.E. (Civil Structures)
OPTIMIZATION TECHNIQUES
(2008 Pattern) (Elective - IV)

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) a) Solve the following LP problems by the revised simplex method. [13]

Minimize $f = 5x_1 + 2x_2 + 5x_3 - 3x_4$

Subject to $2x_1 + x_2 - x_3 = 6$

$$3x_1 + 8x_3 + x_4 = 7$$

$$x_i \geq 0, i = 1 \text{ to } 4$$

b) State six structural engineering applications of optimization. [12]

Q2) a) A beam of uniform rectangular cross - section is to be cut from a log having a circular cross-section of diameter $2a$. The beam has to be used as a cantilever beam (the length is fixed) to carry a concentrated load at the free end. Find the dimensions of the beam that correspond to the maximum tensile (bending) stress carrying capacity. [13]

b) Explain revised simplex method. Duality in linear programming, Decomposition principle, and Post -optimality analysis in Linear Programming. [12]

Q3) a) Minimize the function using the golden section method with $n = 6$. [12]

$$f(x) = 0.65 - [0.75/(1+x^2) - 0.65x \tan^{-1} (1/x)]$$

b) Find the minimum of $f = \lambda^5 - 5\lambda^3 - 20\lambda + 5$ by the cubic Interpolation method. [13]

P.T.O.

SECTION - II

- Q4)** a) Design the cantilever beam with X_1 width, X_2 depth and point load P at the end of beam, formulate the problem of determining the cross-sectional dimensions of the cantilever beam for minimum weight. The maximum permissible bending stress is σ_y . [12]
- b) Explain. [13]
- i) Indirect search method and Direct search method.
 - ii) Random search method and Steepest Descent (Cauchy) method
 - iii) Univariate and pattern search method.
- Q5)** a) Show that the Newton's method finds the minimum of a Quadratic function in one iteration, $F(X) = \frac{1}{2} X^T [A] X + B^T X + C$ [12]
- b) Minimize the interior penalty function. [13]
- $$f(x_1, x_2) = \frac{1}{3} (x_1 + 1)^3 + x_2$$
- Subject to $g_1(x_1, x_2) = -x_1 + 1 \leq 0$
 $g_2(x_1, x_2) = -x_2 \leq 0$
- Q6)** a) Differentiate biological neural network and artificial neural network. [6]
- b) What are the activation functions in artificial neural network? [7]
- c) Explain with suitable sketch and examples Selection Operator, Crossover Operator and Mutation Operator in Genetic Algorithms. [12]



Total No. of Questions : 12]

SEAT No. :

P4879

[Total No. of Pages : 3

[5155] - 5

M.E (Mechanical) (Heat Power)
TECHNOLOGY AND FINANCIAL MANAGEMENT
(2008 Pattern)

Time :3 hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answer any one question from Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 2) *Answer 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.*

SECTION - I

Q1) a) What constitutes financial management? What is the role of finance manager? [8]

b) Describe in brief any four major functions of Financial management?[8]

OR

Q2) a) Mention and discuss any four objectives of the Financial Management?[8]

b) Explain the areas to be looked into in working Capital Management?[8]

Q3) a) Distinguish between: [8]

- i) Direct and indirect labor cost
- ii) Cost control and cost reduction

b) Explain with example, how the costs are classified based on the following. [8]

- i) Function
- ii) Controllability

OR

Q4) a) Write short note on Break even analysis. [8]

b) What are distinctive characteristics of process costing. [8]

- Q5)** Write short notes on any three of the following: [18]
- Components of balance of payments.
 - Trial balance - its purpose and relevance.
 - Income elasticity of demand.
 - Profit - Liability or asset.

OR

- Q6)** a) Explain the following in brief: [10]
- Types of unemployment
 - Oligopoly
- b) Explain the effect of inflation of business and economy. [8]

SECTION - II

- Q7)** a) Explain with example pull and push type of production system. [8]
- b) Explain the concept of JIT in production systems with a neat line diagram. [8]

OR

- Q8)** a) Explain the deming wheel with neat diagram. [8]
- b) What are the four facets of Product Quality? Explain? [8]

- Q9)** a) Discuss in what aspects CPM and PERT techniques differ from each other? [8]
- b) How does network analysis helps in large complex systems? How does the dummy activity serve the purpose? [8]

OR

- Q10)** The data on normal time, and cost and crash time and cost associated with the project are shown in following table: [16]

Activity	Normal		Crash	
	Time (weeks)	Cost (Rs)	Time (weeks)	Cost (Rs)
1-2	3	300	2	400
2-3	3	30	3	30
2-4	7	420	5	580
2-5	9	720	7	810
3-5	5	250	4	300
4-5	0	0	0	0
5-6	6	320	4	410
6-7	4	400	3	470
6-8	13	780	10	900
7-8	10	1000	9	1200

Indirect cost is Rs. 50 per week.

- a) Draw the network diagram for the project and identify the critical path.
- b) What are the normal project duration and associated cost?
- c) Find out the total float with associated with non critical activities.

- Q11)**a) What are the reasons that the organization promotes their employees.
What are the criteria for promotion? [10]
- b) Explain the factors influencing human resource planning. [8]

OR

- Q12)**a) State the objectives and principles of personnel management? [8]
- b) What are the steps involved for introducing Management by objectives in any organization? [10]



Total No. of Questions : 9]

SEAT No. :

P4880

[Total No. of Pages : 2

[5155] - 6
ME (Mechanical Design)
ROBOTICS (Elective - II)
(2008 Pattern)

Time :3 hours]

[Max. Marks :100

Instructions to the candidates:

- 1) Answer three question from each section.*
- 2) Answer to the each section should 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 Robot classifications. **[6]**
- b) Explain Laws of robotics and give at least three configurations of robotic systems. **[10]**
- Q2)** a) Explain terms. **[6]**
- i) Resolutions
 - ii) Repeatability
 - iii) Precision and Accuracy
- b) Explain DH representation for robotic mechanisms. **[4]**
- c) Write a note on Inverse Kinematics with example. **[6]**
- Q3)** a) Explain 3R and 3P manipulators with appropriate sketch. **[10]**
- b) Explain different sensors used in robotics. **[6]**
- i) Position
 - ii) Tactile
 - iii) Vision
 - iv) Speed Measurement

- Q4)** a) Write down Newton Euler's dynamic formulation. [8]
b) Explain Lagrangian Formulation of Manipulator dynamics. [10]

SECTION - II

- Q5)** a) Write down general consideration in path descriptions and generations. [4]
b) Explain Joint space scheme for trajectory planning with sketch. [6]
c) Write down differences of point to point and continuous trajectory. [6]

- Q6)** a) Explain following sensors. [8]
i) Velocity and Acceleration Sensors
ii) Force and Torque Sensors
b) Write a note on Real time operating system for Robotics. [8]

- Q7)** a) Explain hydraulic actuators used in robotics. [8]
b) Explain H - bridge drives for DC motor control. [8]

- Q8)** a) Explain Machine vision system used in Robotics. [10]
b) Write a note on robot programming languages. [6]

- Q9)** Attempt any three [18]
a) Microrobotics
b) Stability issues in legged robots
c) Under actuated Manipulators
d) Telecheirs.



Total No. of Questions : 10]

SEAT No. :

P4881

[Total No. of Pages : 4

[5155] - 7

M.E. (Mechanical) (Design Engineering)
ADVANCED MACHINE DESIGN
(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 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.*
- 6) *Use of logarithmic tables slide rule mollier charts electronic pocket calculator and steam tables is allowed.*

SECTION 1

- Q1) a)** Show with neat sketch various forces acting on inner & outer ring of ring spring with their equations. **[6]**
- b) A disc spring is made at 3mm sheet with an outside diameter of 125 mm & an inside diameter of 50mm. The spring is dished to 4.5mm. The maximum stress to be 560 N/mm². Determine; **[10]**
- i) load carrying capacity of spring
 - ii) The deflection at this load
 - iii) Stresses produced at outer edge
- Q2) a)** What are the factors influences the endurance limit of machine part? **[6]**
- b) A machine component is subjected to two-dimensional stresses. The tensile stress in the X - direction varies from 40 to 100 N/mm², while the tensile stress in the y direction varies from 10 to 80 N/mm². The frequency of variation of these stresses is equal. The corrected endurance limit of the component is 270N/mm². The ultimate tensile strength of the material of component is 660 N/mm². Determine factor of safety. **[10]**
- Q3) a)** Explain the phenomena of creep. What is effect of temperature time & stress on it? How do you calculate permissible life under given stress?**[8]**

P.T.O.

- b) A cantilever beam has a rectangular cross section 5cm wide and 9cm deep. The length of beam is 200 cm with a load of 12000 N on it at the end. The material is carbon steel with $n = 7$ and $B = 40 \times 10^{-39} (\text{cm}^2/\text{N})^n$ per day. Find permanent deflection after 10 years. [8]

Q4) a) Discuss in brief the classical lamination theory (CLT) using the assumptions of CLT, derive relations for the force & moment resultants in terms of mid. Surface strains & curvatures in a multilayered laminate. [8]

- b) For a graphite epoxy unidirectional lamina, find the following. [8]

i) Compliance matrix.

ii) Minor poisson's ratio

iii) Strains in 1-2 coordinate system, if the applied stresses are $\delta_1 = 2$ MPa, $\delta_2 = -3$ MPa, $\tau_{12} = 4$ MPa

The engineering elastic constants of the unidirectional graphite/ epoxy lamina are.

$$E_1 = 181 \text{ GPa}, E_2 = 10.3 \text{ GPa}, \nu_{12} = 0.28; G_{12} = 7.17 \text{ GPa}$$

Q5) Write short notes on : [18]

- a) Transverse shear effects in composite laminates.
 b) Low cycle and high cycle fatigue
 c) Design for brittle fracture.

SECTION II

Q6) a) Explain the concept of 'Geometric programming' [6]

- b) In a light weight equipment shaft is transmitting a torque of 900 N-M & 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 maximum shear stress theory of failure. Use following data. [10]

Material	Mass density (Kg/m ³)	Material cost/wt. (Rs/N)	Yield strength (MPa)	Shear modulus (GPa)
M1	8500	16	130	80
M2	3000	32	50	26.7
M3	4800	480	90	40
M4	2100	32	20	16

- Q7) a)** Explain the term peaking & topping as applied to gear. [6]
- b) Two 20° full depth gear at 20 & 30 teeth are to be designed on the basis of extended centre distance system using the recommended values for

clearance $f = \left(\frac{0.25}{Pd} \right)$. Make the calculations for $Pd = 1$.

Find the following.

- i) Values at q_1 and q_2
- ii) The actual angle ϕ
- iii) The radius of actual pitch circle & centre distance.
- iv) The tooth thickness on actual pitch circle. [10]

- Q8) a)** Explain factorial design & regression analysis. [8]
- b) If a device has a failure rate of 2×10^{-6} failure/hr, what is its reliability for an operating period of 500 hr? If there are 2000 components in the test, how many failures are expected in 500 hrs. ? Assume that strict quality control has eliminated premature failures, so we can assume a constant failure rate. [8]

- Q9) a)** Design the various design considerations for connecting rod at 1.c. engine. [6]
- b) The bore diameter of 4 stroke diesel engine is 150 mm. The maximum gas pressure inside the cylinder is 3.5 MPa. The cylinder head is made of FG 200 ($S_{ut} = 200 \text{ N/mm}^2$) and Fos is 5. Determine thickness of cylinder head.

Studs are used to fix the cylinder head to the cylinder & obtain a leakproof joint. They are made of steel FeE 250 ($S_{ut} = 250 \text{ N/mm}^2$) and Fos is 5. Determine;

- i) Number of studs,
- ii) Nominal diameter of studs
- iii) Pitch of studs [10]

Q10) Write short note on following; [18]

- a) Hybrid materials & applications
- b) Multivariable search method
- c) Design for fatigue failure



Total No. of Questions : 10]

SEAT No. :

P4882

[Total No. of Pages : 4

[5155] - 8

M.E. (Mechanical) (Design Engineering)

RELIABILITY ENGINEERING

(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) Assume suitable data, if necessary
- 5) Figures to the right indicate full marks.
- 6) Use of non-programmable electronic calculators is allowed.

SECTION - I

- Q1) a)** In a survival test conducted on 100 cardboard boxes for their strength under impact loading, the following results were obtained: **[10]**

No. of impacts	20	22	24	26	29	32	35	37	40
No. of boxes failed	7	10	15	14	15	14	13	8	6

For this case, how will you define failure density, failure rate and reliability? Tabulate these quantities and represent them graphically.

- b) Explain life characteristic phases with one common practical application. **[6]**

- Q2) a)** Explain laws of Probability with examples. **[4]**

- b) The failure time of mechanical element follows Weibull distribution with $\beta = 3$, $\eta = 2500$ and $l = 1000$. Find the reliability of the element and the failure rate for an operating time of 3000 Hours. Derive the formula used. **[12]**

- Q3) a)** A generator in the laboratory goes out of order on the average once per 1000 hours of operation. What are the probabilities of the generator failing in 200 hours, 500 hours and 800 hours of operation? **[8]**

- b) Explain Markov analysis with one practical example. **[8]**

P.T.O.

- Q4)** a) Define: availability and maintainability. How “Operational availability” is different from “inherent availability”? [8]
- b) Explain reliability and maintainability trade - off with graphs. [8]

Q5) Write the short note on following (Any Three) [18]

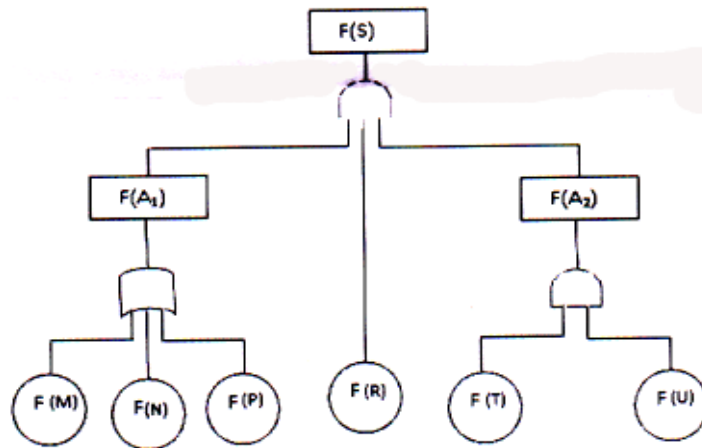
- a) Reliability Engineering Tools
- b) Cut set and tie set method
- c) Chebyshev inequality
- d) MTBF and MTTF
- e) Redundancy

SECTION - II

- Q6)** a) An assembly consists of five subassemblies whose details are given in the table below. The system reliability required is 0.95 for 30 hrs of continuous operating time. Find the values of allocated reliabilities of subassemblies and their failure rates using AGREE method. [8]

Subsystem	No.of modules	Importance factor	Operating time
1	11	1	22
2	15	0.93	16
3	69	0.97	17
4	52	1	21
5	16	0.94	18

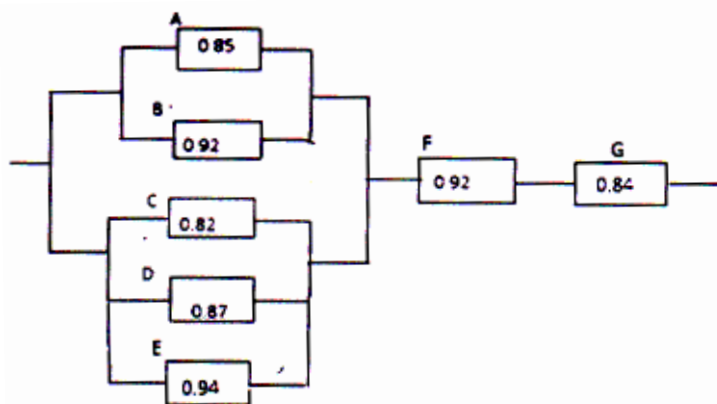
- b) Write a note on Delphi method stating its advantages, limitations and applications. [8]
- Q7)** a) What is the necessity of reliability testing? Define HALT and write methodology, advantages and disadvantages of HALT. [8]
- b) The logic gate diagram for failure of a system is as given below. Draw a block diagram and find the minimal cut sets. Find the reliability of the system if the probability of failure for different elements of system are as given below. Probability of failure of M,N,P,R,T,U is 0.07, 0.05, 0.1, 0.14, 0.09 and 0.02 respectively. [8]



- Q8) a)** What is the use of an Ishikawa diagram? Explain how it can be built and used, with an example. [8]
- b) The steel tubes produced by extrusion process in the factory are found to have average outer diameter of 20.435 mm and standard deviation of 0.5435 mm, normally distributed. Find the following data required by the top management of the factory.
- The percentage of components below 20.400 mm diameter.
 - The percentage of components between 20.6 mm and 20.435 mm diameter. [8]

Z	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
Area	0.004	0.008	0.012	0.106	0.0199	0.0239	0.0279	0.0319	0.0359

- Q9) a)** Write a note on Dynamic programming apportionment. [8]
- b) A system is represented by the block diagram given below and the reliabilities of its elements A to G are as given in the figure. Construct Fault Tree Diagram & find out the reliability of the system. if reliabilities of B and D are changed to 0.94. What will be the new reliability of the system? Write the minimal cut sets. [8]



- Q10)a)** A 60 mm diameter shaft made up of Alloy steel material is having mean yield strength of 380 MPa and standard deviation of 72 MPa. it is subjected to torsional mean stress of 285 MPa and standard deviation of 38 MPa. Find the reliability and the average value of factor of safety for the shaft with the help of part of the standard normal table given below assuming normal distribution. **[10]**

Z	1.1	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	1.19
$\Phi(Z)$	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830

- b) Explain FMECA with the help of an example and write the procedure of finding RPN **[8]**



Total No. of Questions : 10]

SEAT No. :

P4883

[Total No. of Pages : 2

[5155] - 9

M.E. (Mechanical) (Design Engineering)

INDUSTRIAL TRIBOLOGY

(2008 Pattern) (Elective - IV)

Time :3 hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Attempt three questions from section I and three questions from section II.*
- 2) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Discuss various types of friction and Explain Coulomb classical theory of friction. **[8]**
- b) Define Tribology. Explain its importance in industry. **[8]**
- Q2)** a) Derive an expression for load carrying capacity and oil flow rate for hydrodynamic step bearing. State the assumptions made. **[8]**
- b) Obtain Petroffs equation for friction coefficient and power lost in lightly loaded bearings. Also state the assumptions made. **[8]**
- Q3)** a) Explain the term Wear. Explain in detail different types of wear experienced in mechanical systems? Discuss the effect of temperature and load on wear. **[8]**
- b) What do you mean by rolling friction and rolling resistance? Explain Tomlinson's theory of molecular attraction. **[8]**
- Q4)** a) Derive an expression for flow rate through rectangular slot. State the assumptions made. **[8]**
- b) What are the advantages and limitations of hydrostatic bearings over hydrodynamic bearings. **[8]**

P.T.O.

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

- a) Bearing materials
- b) Stick-slip Phenomenon
- c) Sommerfield Number
- d) Heat in bearings

SECTION - II

Q6) a) Derive the expression for the pressure distribution , load carrying capacity and time of approach for a circular plate near a plane under hydrostatic squeeze film lubrication. [8]

- b) State basic requirements of gas lubrication. State the advantages and limitations of gas lubricated bearings. [8]

Q7) For Non - Newtonian behavior of lubrication oils explain the following. [16]

- a) Bingham fluids
- b) Thixotropy
- c) Pseudo plastic flow
- d) Dilatancy
- e) Elasticity

Q8) a) Explain mechanics of tyre road interactions. And discuss the rolling friction model. [8]

- b) Explain tribological aspect of metal workings. [8]

Q9) Using modified Reynolds equation for Elasto-hydrodynamic lubrication , derive Ertel Grubin equation. State limitations of this equation. [16]

Q10) Write a note on following (Any Three) [18]

- a) Tilting pad bearings
- b) Power losses in Hydrostatic step bearing
- c) Piston pin lubrication.
- d) Recycling and processing of used oil



Total No. of Questions : 8]

SEAT No. :

P4884

[Total No. of Pages : 2

[5155]-10

M.E. (Mech. Engg. Heat Power)
ENERGY CONSERVATION AND MANAGEMENT
(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 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) What do you understand by the term 'Evaporation Ratio'? In a furnace oil fired boiler, the evaporation ratio was found to be 21 against the best possible limit of 13. In your opinion what could be the reason for the same? Would you like to recommend the same practice and conditions as the evaporation ratio is more than the feasible limits? **[16]**

Q2) a) What are the methods available for assessing boiler efficiency? Explain briefly. **[8]**

b) Explain the principle of modulating control in a boiler. **[8]**

Q3) a) What are the methods of waste heat recovery in a furnace? **[8]**

b) Why do furnaces operate at low efficiency? What are the parameters to be considered in the design of an efficient furnace? **[8]**

Q4) a) What is cogeneration? Explain in detail cogeneration systems in sugar industry. **[8]**

b) Explain in details the cogeneration system of gas power plant. **[10]**

P.T.O.

SECTION - II

Q5) Explain any three of the following : **[18]**

- a) Energy efficient Refrigeration system
- b) Importance of performance monitoring in energy economics
- c) Electricity act 2001
- d) Energy economics of power plant

Q6) a) Write notes on (any two) : **[8]**

- i) Lighting levels in various applications
- ii) Power factor correction
- iii) Energy efficient motors

b) Two lamps are to be compared : **[8]**

- i) Cost of first lamp is Rs. 1 and it takes 100 Watts.
- ii) Cost of second lamp is Rs. 4 and it takes 60 watts.

Both the lamps are of same candlepower and each has the useful life of 100hr. which lamp will prove economical if the energy is charged at Rs.70 per kW of maximum demand per year plus Rs. 0.05 per kWh?

Q7) a) Explain the waste heat recovery systems used in boiler and explain how efficiency of the plant increases. **[8]**

b) Explain the energy conservation opportunities in refrigeration systems. **[8]**

Q8) a) Explain the flow control strategies and energy conservation opportunities in a pumping system. **[8]**

b) Explain the factors affecting performance of compressed air system. **[8]**



Total No. of Questions : 8]

SEAT No. :

P4885

[Total No. of Pages : 3

[5155]-11

M.E. (Mechanical) (Heat Power)
INTERNAL COMBUSTION ENGINES
(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) *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) Define IP, BP, FP and various efficiencies as applied to SI and CI engines.[8]

b) Following data were obtained on a four stroke, 2 cylinder diesel engine:[8]

Imep = 8 bar, Fuel consumption : 2.6 kg/hr

Speed 1600 rpm, specific gravity of fuel : 0.88

Cylinder bore / stroke = (80/100)mm, CV of fuel : 42000 kJ/kg

Brake load = 300 N, Brake drum diameter= 0.3 m

Calculate :

- i) IP, Bp and mechanical efficiency
- ii) Brake thermal efficiency
- iii) Brake specific fuel consumption in gm/k Wh

P.T.O.

Q2) Enlist the materials used for various engine components along with suitable justification : **[18]**

- a) Engine cylinder
- b) Piston
- c) Valves
- d) Block, bearing
- e) Crank shaft
- f) Gudgeon pin

Q3) Following observations were made during a trial on single cylinder, 2 stroke engine : **[16]**

Cylinder diameter, $d = 300 \text{ mm}$, Stroke $L = 450 \text{ mm}$

Area of indicator, $a = 600 \text{ mm}^2$

Length of indicator diagram $L = 50 \text{ mm}$

Spring number $k = 40 \text{ kN/m}^2$

Speed $n = 1200 \text{ rpm}$, $BP = 220 \text{ kW}$

Fuel used = 7.8 kg in 10 minutes

$CV = 42900 \text{ kJ/kg}$

Cooling water circulated, $m_w = 400 \text{ liter}$ in 10 min

$A : F = 30 : 1$

Exhaust gas temperature $t_g = 350^\circ\text{C}$

Ambient Temperature $t_a = 37^\circ\text{C}$

Rise in cooling water $= 60^\circ\text{C}$

Calculate :

- a) Mechanical efficiency
- b) BTE
- c) Draw Heat balance sheet on kJ/s basis.

- Q4)** a) Explain the stages of combustion in SI engine. [8]
b) Explain actual engine A:F mixture requirements for petrol engine. [8]

SECTION - II

- Q5)** a) What are the sources of SI engine emission. How concentration of NO_x in exhaust gases can be decreased. [8]
b) Write short note on MPFI system. [8]

- Q6)** a) Write a short note on emission norms in India. [8]
b) Write a detailed note on carbon credit. [8]

- Q7)** What are the requirements of a good combustion chamber for CI engines. State classification of CI engine combustion chamber. [16]

- Q8)** Write short notes on : [18]
a) Catalytic converter
b) Euro norms
c) Methods of supercharging



Total No. of Questions : 8]

SEAT No. :

P4886

[Total No. of Pages : 2

[5155]-12

M.E. (Mech.) (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 alternative fuel in SI Engine. [8]
- Q2)** a) Explain the basic requirements of a good combustion chamber and explain with a neat sketch of F 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 control? [8]
- Q3)** a) Explain fuel rating. [8]
b) Describe the SI engine combustion on P- θ graph. [8]
- 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 SI engine to reduce knocking? [10]

P.T.O.

SECTION - II

- Q5)** a) Compare induction swirl and compression swirl in CI engine. [8]
b) Explain the stage of combustion in CI engine. [8]
- Q6)** a) Explain the effect of engine variables on knocking for CI Engine. [8]
b) Explain turbo charger agreements for power boosting for CI engine. [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 emission reduction. [10]
b) Explain M and open combustion chambers for CI engine? [8]



Total No. of Questions : 8]

SEAT No. :

P4887

[Total No. of Pages : 2

[5155]-13

M.E. (Mechanical Engineering) (Heat Power)

NON CONVENTIONAL POWER PLANT

(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 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]
- Q3)** a) Write a note on silent features of electricity act 2003. [8]
- b) With neat sketch explain horizontal axis and vertical axis wind machines. Write down the problems in operating large wind power generators. [8]

P.T.O.

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 : 8]

SEAT No. :

P4888

[Total No. of Pages : 2

[5155]-14

M.E. (Computer Engineering) (Computer Networks)
EMERGING TRENDS IN COMPUTER ARCHITECTURE
(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) *Assume suitable data if necessary.*

SECTION - I

Q1) Draw typical architecture of following parallel computer models and list their features. **[18]**

- a) Parallel vector processor (PVP).
- b) Symmetric multiprocessor (SMP).
- c) Massively Parallel Processor (MPP).

Q2) a) What do you mean by hardware multithreading? Explain various high level synchronization constructs. **[8]**

b) Draw the digital TruCluster networking architecture. Explain the memory channel communication mechanism involved. **[8]**

Q3) a) Discuss the Thread management mechanism in detail. **[8]**

b) Draw and explain four layered ATM network architecture. **[8]**

Q4) Write short notes on : **[16]**

- a) Transmission Control Protocol (TCP).
- b) IBM SP2 System architecture.
- c) PARAM net.
- d) ATM cell format.

P.T.O.

SECTION - II

- Q5)** Explain following parallel programming models in detail. **[18]**
- a) Message - passing model.
 - b) Data - parallel model.
 - c) Shared - variable model.
- Q6)** a) Draw and explain ARCC model of grid computing. **[8]**
- b) Give differences between SAN, NAS and DAS. **[8]**
- Q7)** a) Discuss various Parallel programming paradigms with neat diagram. **[8]**
- b) Explain briefly various communication functions implemented as a part of MPI. **[8]**
- Q8)** Write short notes on : **[16]**
- a) Parallel virtual machine.
 - b) Topology used in Storage Area Network (SAN).
 - c) Grid architecture.
 - d) Multicore architecture.



Total No. of Questions : 10]

SEAT No. :

P4889

[Total No. of Pages : 2

[5155]-15
M.E. (Computer)
PRINCIPLES AND PRACTICES FOR IT MANAGEMENT
(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.*
- 6) Assume suitable data if necessary.*

SECTION - I

- Q1)** a) Explain process of Management in IT Project Management in detail. [8]
b) What are the social responsibilities follows in IT management. [8]
- Q2)** a) State requirement analysis for IT projects in detail. [8]
b) What is role of work break down structure? How it implemented in IT project management. [8]
- Q3)** a) What is importance of budgeting the project? Explain how budget for IT projects estimated. [8]
b) Explain the role of project network diagram in IT project. [8]
- Q4)** a) Explain the concepts of risk management? How it helps in IT project.[8]
b) How changes in IT project are implemented explain with example. [8]
- Q5)** Write short notes (any three) [18]
a) Business Ethics
b) Resource procurement
c) Reasons for delays in IT Projects
d) Tracking IT projects

P.T.O.

SECTION -II

- Q6)** a) Explain the team formation for IT project in detail. [8]
b) What is destructive conflict? How it resolve. [8]
- Q7)** a) How employee welfare policies useful in IT management? Explain with example. [8]
b) Explain how team meetings are carried out in management. [8]
- Q8)** a) Explain change management with suitable examples. [8]
b) What is Intellectual Property Right (IPR). Explain the process for IPR. [8]
- Q9)** a) What is Six Sigma? Explain its importance in IT management. [8]
b) Explain various applications of IT Management in customer relationship management. [8]
- Q10)** Write short notes (any three) [18]
- a) CMM
 - b) Energy Management
 - c) Formal & In Formal groups
 - d) Technology Management



Total No. of Questions : 8]

SEAT No. :

P4890

[Total No. of Pages : 2

[5155]-16

M.E. (Computer Engineering)
ADVANCED SOFTWARE 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) *Answer any three questions from each section.*
- 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 system engineering process. **[8]**
b) State the dimensions of dependability and explain. **[8]**
- Q2)** a) Explain the spiral model for software development. **[8]**
b) Explain the data flow models with an example. **[8]**
- Q3)** a) Explain the control models for event driven systems. **[8]**
b) Explain the real time system modeling with a state machine. **[8]**
- Q4)** Explain the following. (Any three) **[18]**
a) Concurrent objects
b) Transaction processing system
c) UI design process
d) Prototyping

P.T.O.

SECTION - II

- Q5)** a) Explain path testing method. [8]
b) Explain in brief the COCOMO II models for estimation. [8]
- Q6)** a) Explain change management process. [8]
b) How agile process models adapt changes in software? Explain with a process model. [8]
- Q7)** a) Explain the Risk analysis process. [8]
b) How reliability for critical system is predicted? Explain. [8]
- Q8)** Explain the following (Any three) [18]
a) Fault detection
b) Process Improvement
c) Black box testing
d) Design pattern



Total No. of Questions : 8]

SEAT No. :

P4891

[Total No. of Pages : 2

[5155]-17

M.E. (Computer Engineering)
INTERNET ROUTING DESIGN
(2008 Course) (Semester - I) (Elective - I (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) *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 classful addressing and CIDR. [8]
b) Write and explain the algorithm for shortest path computation when candidate paths are known. [8]
- Q2)** a) Explain Dijkstra's shortest path first algorithm for centralized approach. [8]
b) Explain basic framework for distance vector routing protocol. [8]
- Q3)** a) Write and explain path vector protocol with path caching. [8]
b) What are the sub-protocols of a link state Protocol? Compare distance vector protocol and link state protocol. [8]
- Q4)** a) Explain in detail similarities and differences between IS-IS and OSPF. [9]
b) Explain packet format of RIPV1. Compare RIPV1 and RIPV2. [9]

P.T.O.

SECTION - II

- Q5)** a) Explain basic forwarding functions and complex forwarding functions of a router. [8]
b) Explain Route reflection approach in BGP. [8]
- Q6)** a) Explain with example Ternary CAM based lookup. State advantages and disadvantages of TCAM. [8]
b) Explain why longest prefix match is important and define longest prefix matching problem. Explain why prefix expansion is required. [8]
- Q7)** a) Explain with an example the algorithm for binary search on prefix lengths. [8]
b) Explain with an example Lucent bit vector approach for packet classification. [8]
- Q8)** Write short note on :
- a) Source – Based QOS routing with path caching. [6]
b) Routing for voice over MPLS. [6]
c) QOS attributes. [6]



Total No. of Questions : 8]

SEAT No. :

P4892

[Total No. of Pages : 2

[5155]-18
M.E. (Computer)
MOBILE COMPUTING
(2008 Pattern) (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) Attempt any three questions from each section.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data & draw neat diagrams wherever necessary.*

SECTION - I

- Q1)** a) Write a short note on SIM. **[8]**
- b) Explain any two with neat diagram **[8]**
- i) BTS
 - ii) BSC
 - iii) TRAV
- Q2)** Write a short note on each of the following. Draw diagram if necessary.
- a) MSC **[4]**
 - b) HLR **[4]**
 - c) VLR **[4]**
 - d) EIR **[4]**
- Q3)** a) Explain OSI reference model in context of mobile computing. **[8]**
- b) Write a short note on the Abis – Interface. **[8]**

P.T.O.

Q4) Explain in detail following of Air – Interface of GSM

- a) Structure of Air - interface [6]
- b) Physical versus logical channels [6]
- c) Logical channel configuration [6]

SECTION - II

Q5) Explain NSS with neat diagrams [16]

Q6) Write short note on each

- a) FDMA [6]
- b) TDMA [6]
- c) CDMA [6]

Q7) a) Explain SCCP protocol [8]

b) Explain TCAP protocol. [8]

Q8) a) Write a short note on Mobility Management. [8]

a) Write a short note on MAP protocol. [8]



Total No. of Questions : 8]

SEAT No. :

P4893

[Total No. of Pages : 2

[5155]-19

**M.E. (Computer Engineering)
INFORMATION AND NETWORK SECURITY
(Semester -I) (2008 Pattern) (Elective -II)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to 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 table is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION -I

- Q1)** a) What is information security policy? Describe various steps necessary for creating information security policy. [7]
- b) Explain main provisions in cyber laws with respect to information and network security. [7]
- c) Describe various threat scenarios. [4]
- Q2)** a) Enlist and explain various requirements a public key cryptosystems need to fulfil to be a secure algorithm? [8]
- b) Describe DES Design criteria and explain purpose of the S-boxes in DES? [8]
- Q3)** a) What is access control? Explain with suitable example logical and physical access control. [8]
- b) Explain in detail different protections provided by secure socket layer?[8]

P.T.O

- Q4)** Write short notes on (any three) **[16]**
- a) Issues in multi-level secure systems
 - b) Fragmentation vulnerabilities
 - c) Encryption principals
 - d) Privacy and data protection

SECTION -II

- Q5)** a) Enlist and explain various Routing algorithm vulnerabilities. **[10]**
b) Describe different ways in which password transmitted over a telnet connection can be captured. Discuss secure alternatives. **[8]**
- Q6)** a) What is network partitioning? Explain with respect to firewalls. **[8]**
b) Explain the different between a packet-filtering router and a stateful inspection firewall. **[8]**
- Q7)** a) What are the essential properties and requirements for a digital signature? **[8]**
b) Describe different methods and procedures for security in wireless networks. **[8]**
- Q8)** Write short notes on (any three) **[16]**
- a) Discrete logarithm problem
 - b) Session key management
 - c) Secure routing interoperability
 - d) Time stamping and reliable ordering of events



Total No. of Questions : 8]

SEAT No. :

P4894

[Total No. of Pages : 3

[5155]-20
M.E. (Computer)
WEB SERVICES AND SOA
(2008 Pattern) (Elective -II) (Theory)

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)** a) What do you mean by WSDL? Explain WSDL Document structure in detail. **[6]**
- b) Explain what do you understand by registry, UDDI. **[4]**
- c) What is significance of SOAP in terms of Web Services? Also explain SOAP message structure. **[6]**
- Q2)** a) What are best practices for selecting an SOA solution? **[4]**
- b) Explain SOA architecture in detail. Give run time and design time requirements for SOA. **[8]**
- c) Describe ESB in detail. **[4]**
- Q3)** a) Explain common and primary stages related to SOA projects lifecycle. Give suitable example. **[8]**
- b) Give different benefits of Business centric SOA. **[4]**
- c) Explain any two non-functional requirements in SOA implementation. **[4]**

P.T.O

Q4) Write short notes on (any three) [18]

- a) SOA enterprise software models
- b) Web Services Policy
- c) Enterprise solution assets (ESA)
- d) SOA Delivery Strategies
- e) SOA characteristics

SECTION -II

Q5) a) What are different SOA design activities? [4]

b) Describe any two tools available for appropriate SOA designing. [6]

c) Explain Designing service integration environment. [6]

Q6) a) Explain any two SOA standards. [4]

b) Describe role of ESB in SOA governance. [4]

c) Describe how SOA governance extends its relationship towards Enterprise. Architecture Governance and IT Governance to support Business Governance. [8]

Q7) a) What is AJAX and what is need for it. [4]

b) What are BLOGS, and how BLOGS can be used in educational institute by different stakeholders? [6]

c) Explain SOA Governance in terms of [6]

i) Roles and responsibilities

ii) Policies

iii) Critical success factors

Q8) Write short note on (any three)

[18]

- a) Web 2.0
- b) Role of ESB in SOA governance
- c) Wikis
- d) Security implementation in SOA
- e) Service-oriented design process



Total No. of Questions : 8]

SEAT No. :

P4895

[Total No. of Pages : 2

[5155]-21
M.E. (Computer Engineering)
DISTRIBUTED SYSTEMS
(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) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*

SECTION -I

- Q1)** a) Explain the trends in distributed systems. **[8]**
b) Explain the tiered architectural pattern for distributed system. **[8]**
- Q2)** a) Explain the design issues in Remote Method invocation. **[8]**
b) Elaborate "Web Search" as an example of distributed system. **[8]**
- Q3)** a) Explain bully algorithm. In the bully algorithm, a recovering process starts an election and will become the new coordinator if it has a higher identifier than the current incumbent. Is this a necessary feature of the algorithm? **[8]**
b) Explain the Cristian's method for synchronizing clocks. **[8]**
- Q4)** Write short notes on (any three) **[18]**
- a) IP Multicast
 - b) Sun RPC
 - c) Clocks
 - d) Mutual Exclusion

P.T.O

SECTION -II

- Q5)** a) With the help of a schematic of file service architecture, explain different modules in it. [8]
b) Explain why iterative navigation is necessary in a name service in which different name spaces are partially integrated, such as the file-naming scheme provided by NFS. [8]
- Q6)** a) Explain the "Structure of data" as a design and implementation issue in distributed shared memory. [8]
b) Explain in brief-Causal and Processor Consistency models. [8]
- Q7)** a) Explain the role of servlet container in deploying of a web service and execution of a client request. [8]
b) Outline the main difference between TLS and XML security. Explain why XML is particularly suitable for the role it plays, in terms of these differences. [8]
- Q8)** Write short notes on (any three) [18]
a) Digital signatures with secret keys
b) WSDL
c) Global Name Service
d) Potential Attacks to computer systems



Total No. of Questions : 8]

SEAT No. :

P4896

[Total No. of Pages : 3

[5155]-22

**M.E. (Computer Engineering/Computer Networking)
HIGH PERFORMANCE DATABASE SYSTEMS
(2008 Course) (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 TP-monitor Architecture. [6]
b) Discuss tunable parameters and different techniques used for tuning of databases. [6]
c) Explain various TPC benchmarks. [4]
- Q2)** a) Discuss the importance of low level primitive operations incase of Query optimizations. [6]
b) Explain hash join algorithm with example. [6]
c) Discuss how materialized view are important in query optimization. [4]
- Q3)** a) Discuss the choice of indexing (B-tree or hash file) for a relation. Justify your answer. [6]
b) Compare between optimistic & Pessimistic locking for concurrency control. [6]
c) Discuss flat and Nested transactions. [4]

P.T.O

- Q4)** a) Explain data warehouse Architecture. [6]
 b) Explain various data warehouse schemes with examples. [6]
 c) Explain OLAP operation with example. [6]

SECTION -II

- Q5)** a) How XML integration is achieved with SQL servers. [6]
 b) Discuss Aggregations in SQL. [6]
 c) Discuss about SQL 3 standards, objected oriented and security features. [4]

- Q6)** a) Given the following transactional data. [6]

Sr. No	Transaction ID (TIDs)	List of Items (IDs)
1	T100	I1, I2, I5
2	T200	I2, I4
3	T300	I2, I3
4	T400	I1, I2, I4
5	T500	I1, I3
6	T600	I2, I3
7	T700	I1, I3
8	T800	I1, I2, I3, I5
9	T900	I1, I2, I3

Find candidate and frequent itemsets using APRIORI algorithm where minimum support count is 2.

- b) Explain decision tree induction & write basic algorithm for inducing decision tree from training tuple. [6]
 c) List and explain Data mining applications. [4]

- Q7)** a) Explain Active and Deductive databases. [6]
b) Explain merits and demerits of main memory database. [6]
c) Brief about Semantic database. [4]

Q8) Write a short note on (any three) [18]

- a) LDAP
- b) XML
- c) Multimedia Database
- d) Hibernate



Total No. of Questions : 8]

SEAT No. :

P4897

[Total No. of Pages : 2

[5155]-23

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) Explain in detail Poisson Random Variable with its suitable example? [8]
b) Explain Memory less property of Exponential Variable. [8]
- Q2)** Describe following network data Models (any two) [16]
i) M/G/1
ii) M/M/m/m
iii) m-server loss system
- Q3)** Write a short note on [18]
a) Throughput in the finite Buffer Case
b) Little's formula to an M/M/1 Queue
c) Advanced Queueing Models
- Q4)** a) Explain Bayes formula with suitable example. [8]
b) Consider an M/M/1 system in which customers arrive according to a Poisson process of rate λ . Service rate is $\mu = 50$ customers/ minute. The average number of customers is $N = 4$. Calculate λ and W . [8]

P.T.O

SECTION -II

- Q5)** a) Explain Queuing Network Model of Nodes in a PSN. [6]
b) Solve Terminal Assignment problem for given data. [10]
weight of node = 01
Max. capacity of concentrator = 04

	<i>G</i>	<i>H</i>	<i>I</i>	<i>K</i>
<i>a</i>	6	5	8	1
<i>b</i>	4	12	12	12
<i>c</i>	25	5	16	4
<i>d</i>	15	18	15	2
<i>e</i>	12	29	1	23
<i>f</i>	4	25	15	1

- Q6)** a) Describe different Security management tools. Explain importance of it. [8]
b) Explain Bin Packing algorithm with example. [8]
- Q7)** a) Explain with neat diagram architecture of network node. [8]
b) Explain different challenges in modifying network implementation. [8]
- Q8)** Write a short note on (any three) [18]
a) Role of Network Administrator
b) Subnet Mask
c) Performance analysis of datalink layer
d) Network Implementation



Total No. of Questions : 8]

SEAT No. :

P4898

[Total No. of Pages : 2

[5155]-24

M.E. (Computer Engineering)
NETWORK PROGRAMMING
(2008 Pattern) (Elective -III)

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.*

SECTION -I

- Q1)** a) Explain the TCP state transition diagram in details with connection establishment and termination, explain Role of Listen function. [10]
b) Explain with diagram interconnection between various protocols in TCP/IP Protocol Suit. [6]
- Q2)** a) Explain IPV4/IPV6 socket address structure, write byte ordering function with the help of suitable program. [8]
b) Explain various TCP socket options. [8]
- Q3)** a) Explain in details operation perform using routing socket. [10]
b) Explain the following terms with the help of function and parameter Descriptor.
i) IPV4 socket address structure
ii) Listen function
ii) Recv from function [6]
- Q4)** a) Explain the fetching and printing a routing table entry process, write program to issue RTM-GET command on routing socket. [8]
b) Draw the argument of client resolver and name server in DNS, Explain the day time client program using gethost by name () and get server by name () function using suitable code. [10]

P.T.O

SECTION -II

- Q5)** a) What is resource discovery? Explain the internet application that used broad casting with example? [8]
b) Compare and explain unicast and broadcast packet and frame format. [8]
- Q6)** a) Explain in details Multicasting on WAN and also explain multicast socket options. [10]
b) Explain network time protocol in details with explain [6]
- Q7)** a) Explain basic tread functions for TCP echo server example in details.[10]
b) explain simultaneous connection using thread for web client. [6]
- Q8)** Write short note on (any three) [18]
a) Simple Network Time Protocol
b) TCP Pre-threaded server
c) TCP concurrent server
d) IPV6 address testing MACROS



Total No. of Questions : 6]

SEAT No. :

P4899

[Total No. of Pages : 2

[5155]-25

**M.E. (Computer Engineering)
ADVANCED INTERNET PROGRAMMING
(2008 Pattern) (Elective -III)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Attempt any five questions out of 6 questions.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) a) Draw & Explain N-tire architecture, also explain challenges in design of N-tire architecture? **[8]**

b) Draw & explain the importance of resolver in DNS server? **[7]**

c) What is DOM? Explain it with suitable example? **[5]**

Q2) a) Which design pattern is used to decouple presentation tier and business tier? Assume suitable data and draw class diagram for the same. **[5]**

b) Explain in details role of container, types of containers used in J2EE architecture. **[7]**

c) Write short note on: **[8]**

i) Struts frame work

ii) J2EE specification

Q3) a) Give the definition of Java applets and explain with suitable example? **[6]**

b) Write short note on: **[8]**

i) JS functions

ii) JS operators

iii) JS variables

iv) JS events

P.T.O

- c) How to create JS object? How to access object properties and object method? [6]
- Q4)** a) Draw & Explain four major phases of JSP life cycle? [6]
b) What are the disadvantages of CGI? How they can be overcome by servlet? [6]
c) What are the methods that HTTP protocol supports to retrieve data from server? Explain in detail. [8]
- Q5)** a) Explain how servlet calls service () method to process a client's request? [6]
b) Write short note on Java Beans. [6]
c) Write a sample program for database connectivity using JDBC? [8]
- Q6)** a) Explain the following concepts in terms of Evolution of Portal [8]
i) Information searching
ii) Information dissemination
iii) Collaboration
iv) Business service integration
b) Define internationalization and localization? Explain its goal in detail? [6]
c) What are the steps to send email using Java Mail API? Explain it? [6]



Total No. of Questions : 8]

SEAT No. :

P4900

[Total No. of Pages : 3

[5155]-26

**M.E. (Computer Engineering)
SOFTWARE PROJECT MANAGEMENT
(2008 Pattern) (Semester -II) (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) From section-I, Answer (Q1 or Q2) and (Q3 or Q4)*
- 3) From section-II, Answer (Q5 or Q6) and (Q7 or Q8)*
- 4) Neat diagram must be drawn whenever necessary.*
- 5) Figures to the right indicate full marks.*
- 6) Assume suitable data, if necessary.*

SECTION -I

- Q1)** a) Discuss the need for project management, activities involved in project management and benefits out of it. [8]
- b) Explain major challenges in project management and how to overcome it. [8]
- c) State what is meant by issues in a project? Give example of a typical issues-log used in a project? [9]

OR

- Q2)** a) Enlist and explain in detail the characteristics associated with project. [8]
- b) How to meet the organization expectation by software team. [8]
- c) Explain the significance of software project management with its activity. [9]
- Q3)** a) List out typical five risks associated with a software project and their mitigation steps. [9]
- b) Explain the tools and methods used for software project planning. [8]
- c) How the risk analysis help in project management. [8]

P.T.O

OR

- Q4)** a) Discuss different software quality factor. [9]
- b) Write a short note (any two) [16]
- i) Project Management Practices
- ii) Risk Assessment
- iii) Work break down Structure

SECTION -II

- Q5)** a) Explain the role of stakeholders in project management. [8]
- b) Explain how project performance can be improved through qualitative analysis. [8]
- c) Explain aspects helping in designing critical platforms for success story of projects. [9]

OR

- Q6)** a) State what are the typical sections which are included in a project management plan. [8]
- b) Who are the stakeholders of an IT project? Elaborate the aspects to be considered for them while project management. [8]
- c) Explain the estimation using function point analysis. [9]
- Q7)** a) Explain different metrics used in the project management. [9]
- b) Enlist and explain fourteen general system characteristics used as basis in the calculation of value adjustment factor. [16]

OR

- Q8)** a) Discuss the software measurement with function points. And also explain use of function point. [9]
- b) Write a short note (any two) [16]
- i) Assessing project viability
 - ii) Project control
 - iii) Configuration management



Total No. of Questions : 8]

SEAT No. :

P4901

[Total No. of Pages : 2

[5155]-27

M.E. (Computer Engineering) (Semester - II)
INFRASTRUCTURE MANAGEMENT (Elective - IV)
(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.*
- 5) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) What are the current business demands and IT systems issues? [6]
b) Discuss on complexity of today's computing environment. [4]
c) Define System Management. Explain in detail how the growth of Internet has affected the system management. [8]
- Q2)** a) Write short note on IT services availability management. [6]
b) How to determine the customer requirements? Explain the effect of Customer requirement on the infrastructure management. [10]
- Q3)** a) Explain following items in brief with respect to Availability Management [4]
i) Input & Output
ii) Critical success factors & Risks
b) What are the Factors to be considered in designing IT organizations and IT infrastructure? [6]
c) Explain IT Services in Continuity Management Process. [6]

P.T.O.

- Q4)** a) Explain benefits of Finance Management. [4]
b) Define the key decisions for Financial Management. [4]
c) Enlist and explain ITIL service delivery processes. [8]

SECTION - II

- Q5)** a) Explain the steps in incident management process. [8]
b) What is configuration management? Why should Implement Configuration Management? [8]
- Q6)** a) What is a Service Desk.why it is important? [8]
b) What are the differences between incident management and problem management? [4]
c) Explain objectives of avability Management [4]
- Q7)** a) What is incident management? Implement incident management with flowchart? [10]
b) Define Release Management Policies. [6]
- Q8)** a) What are the important challenges in storage virtualization? Explain in detail different types of storage virtualization. [8]
b) What are the components of NAS? What are the mechanisms for implementation of NAS? Explain in detail how connectivity is established for the different mechanisms. [10]



Total No. of Questions : 10]

SEAT No. :

P4902

[Total No. of Pages : 2

[5155]-28

M.E. (Computer Engineering) (Semester - II)
DATA WAREHOUSING AND DATA MINING
(2008 Pattern) (Elective - IV)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Q.1 and Q.6 are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*
- 4) *Solve any two questions from Q.2,Q.3,Q.4,Q.5.*
- 5) *Solve any two questions from Q.7,Q.8,Q.9,Q.10.*
- 6) *Answers to the two sections should be written in separate books.*

SECTION - I

- Q1)** a) Explain design methodology of data warehouse. [8]
b) Explain multidimensional model with suitable example. [8]
- Q2)** a) Discuss issues to be considered during data integration. [8]
b) Why it is necessary to preprocess data? Explain in detail Data cleaning steps. [9]
- Q3)** a) What is concept description? Explain summarization based characterization. [8]
b) What is association mining? Explain Apriori algorithm. [9]
- Q4)** a) Explain different methods for handling data redundancy in data integration. [8]
b) Explain frequent pattern growth algorithm with suitable example. [9]

P.T.O.

- Q5)** Write a short note on **[17]**
- a) OLAP
 - b) corelation analysis
 - c) data mining primitives

SECTION - II

- Q6)** a) Explain classification using decision trees. **[8]**
b) Explain different parameters to evaluate classification model. **[8]**
- Q7)** a) Explain the different distance measures in clustering mining task. **[8]**
b) Explain k-means clustering with suitable example. **[9]**
- Q8)** a) Explain spatial association with suitable example. **[8]**
b) Explain keyword association and document classification method in text mining. **[9]**
- Q9)** a) Define information retrieval system. Describe vector space model. **[8]**
b) Explain Rough set data mining approach with suitable example. **[9]**
- Q10)** Write a short note on **[17]**
- a) Genetic algorithms
 - b) web mining
 - c) outlier analysis



Total No. of Questions : 8]

SEAT No. :

P4903

[Total No. of Pages : 2

[5155]-29

M.E. (E&TC/Electronics) (Semester - I)

Microwave / VLSI Embedded Systems /Communication Network / Signal Processing / Digital Systems

**PRINCIPLES AND PRACTICES FOR IT MANAGEMENT
(2008 Pattern)**

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 the following functions of Management [10]
i) organizing
ii) controlling
b) Discuss the various skills required for the manager. [6]
- Q2)** a) Explain the role & importance of business policy. [8]
b) Discuss in detail the steps in revising the project plan. [8]
- Q3)** a) Explain in detail Business ethics & social responsibility [8]
b) Write short notes on tracking project progress and financial obligations.[8]
- Q4)** Write short note on any three [18]
a) Process of creating work break down structure (WBS).
b) Six Sigma
c) Strategies for resolving the destructive conflict. d) planning of an IT project

P.T.O.

SECTION - II

- Q5)** a) Explain the application of IT in agriculture sector. [8]
b) Discuss supply chain management (SCM) as modern approach to management. [8]
- Q6)** a) State and explain various project quality standards. [8]
b) Explain in detail stress management [8]
- Q7)** a) Explain the process of creating budget in details. [8]
b) Establish the relation between project estimation and risk management.[8]
- Q8)** Write short notes on [18]
a) IPR and Cyber law
b) Energy management & Energy audit
c) Application of IT in Banking & insurance.



Total No. of Questions : 6]

SEAT No. :

P4904

[Total No. of Pages : 2

[5155]-30

M.E. (E&TC) (Microwave) (Semester - II)

MICROWAVE INTEGRATED CIRCUITS

(2008 Pattern)

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 if necessary.*

SECTION - I

- Q1)** a) Describe the technological steps involved in the fabrication of hybrid MICs [9]
- b) Discuss Impedance and admittance parameters. [8]
- c) Write a short note on: Monolithic microwave integrated circuits. [8]
- Q2)** a) Write a short note on: [12]
- i) Microstrip line
- ii) Coplanar line
- iii) Slot line
- b) Design a circular microstrip antenna using a substrate (RT/Duriod 5880) with a dielectric constant of 2.2, $h=0.1588\text{cm}$ (0.0625in) so as to resonate at 10 GHz. [13]
- Q3)** a) How the calibration of network analyzer is achieved? [13]
- b) What are microwave discontinuities? Discuss in detail. [12]

P.T.O.

SECTION - II

Q4) a) A two port network has the scattering matrix shown below: **[16]**

$$\begin{bmatrix} 0.15\angle 0^\circ & 0.85\angle -45^\circ \\ 0.85\angle 45^\circ & 0.2\angle 0^\circ \end{bmatrix}$$

- i) Is this network lossless?
- ii) Is this network reciprocal?
- iii) What is the return loss at port 1 when all ports are terminated with matched load?
- iv) What is the return loss at port 2 when all ports are terminated with matched load?

b) Explain uncertainty and confidence in measurement. **[9]**

Q5) a) Explain in detail the techniques involved in the measurement of noise in MIC circuits. **[13]**

b) Explain in brief power splitter and coupler. **[12]**

Q6) Write a notes on applications of MICs to **[25]**

- a) Radio System
- b) Satellite Communication
- c) Broadcast System
- d) Future trends' in MICs.



Total No. of Questions : 8]

SEAT No. :

P4905

[Total No. of Pages : 2

[5155]-31

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.
- 5) Assume suitable data, if necessary.

SECTION - I

- Q1)** a) Describe the evolution of wireless communication [9]
b) Explain FDMA multiple access technique. Compare it with other techniques. [9]
- Q2)** a) Discuss [8]
i) Erlang distribution
ii) Spectral efficiency
b) Discuss the traffic measurement units in mobile communication. [8]
- Q3)** a) Write a note on co-channel interference suggest techniques to remove it. [8]
b) Discuss pathloss in mobile communication. [8]
- Q4)** a) Explain different channels used in GSM. [8]
b) Write a note on privacy and security in GSM. [8]

P.T.O.

SECTION - II

- Q5)** a) Compare GSM & CDMA. Explain IS-95 architecture. [9]
b) Explain soft hand off in CDMA. [9]
- Q6)** a) Describe physical & logical channels of IS-95. [8]
b) Explain diversity techniques in mobile communication. [8]
- Q7)** a) Explain any one spread spectrum technique used in wireless communication. [8]
b) Write a note on GMSK modulation technique. [8]
- Q8)** a) Explain OFDM technique in detail. [8]
b) Write a note on RLS algorithm. [8]



Total No. of Questions : 8]

SEAT No. :

P4906

[Total No. of Pages : 2

[5155]-32

**M.E. (E&TC) (VLSI & Embedded Systems)
ANALOG AND DIGITAL CMOS IC DESIGN
(2008 Pattern) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from section – I & section-II.*
- 2) Answer to the two section should be written in separate answer book.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) With the help of detailed equivalent circuit diagram explain the parasitic capacitances and resistances involved in a MOSFET. [8]
- b) With suitable schematic explain the concept of weak 0 and weak 1. [8]
- Q2)** a) What are the performance parameters of voltage reference circuit? Explain in brief? What is state of art? [8]
- b) Design cascade current source for a load current of $500\mu\text{A}$. Calculate R_{out} ? [8]
- Q3)** Design difference amplifier for voltage gain of 60db. Compute CMRR, R_{out} & suggest the important techniques. [16]

P.T.O.

- Q4)** Write short notes on any three : **[18]**
- a) Push pull inverter.
 - b) BGR.
 - c) Cascode amplifiers.
 - d) Low voltage Op-amp.

SECTION - II

- Q5)** a) What is metastability explain with timing relation? What are the solutions to it? **[8]**
- b) Explain hazards in details? What are the elimination techniques? **[8]**
- Q6)** a) What is power dissipation? Derive the expression for Power Delay Product and Energy Delay Product. **[8]**
- b) What is active area on chip? Design CMOS logic for $F = ABC + DEF + G$. Compute area. **[8]**
- Q7)** Write short notes on any three : **[18]**
- a) Domino logic.
 - b) Trends for fast logic.
 - c) Lambda parameter.
 - d) CMOS parasitic.
 - e) Stick diagram and CMOS Layout.
- Q8)** a) Draw FSM state diagram & write VHDL code for 11101 mealy sequence detector. **[12]**
- b) What is technology scaling? Explain its effects. **[4]**



Total No. of Questions : 10]

SEAT No. :

P4907

[Total No. of Pages : 3

[5155]-33

M.E. (E&TC) (VLSI & ES)
MEMORY TECHNOLOGIES
(2008 Pattern) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answers any three questions from each section.*
- 2) *Answers to the 2 sections should be written in separate book.*
- 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]

P.T.O.

- 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) Significance of testing of semiconductor memory.
b) Radiation effect on semiconductor memory.
c) Antifuse, explain in brief.
d) IDDQ Fault modeling and Testing.

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.
- e) Memory Cards.



Total No. of Questions : 8]

SEAT No. :

P4908

[Total No. of Pages : 2

[5155]-34

M.E. (Electronics) Digital Systems
DIGITAL SIGNAL COMPRESSION
(2008 Pattern) (Elective - IV) (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 must be written in separate answer books.*
- 3) *Use of scientific calculator is allowed.*
- 4) *Assume suitable data wherever required.*
- 5) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) What is lossless compression? Why compression of the data is done'? Explain arithmetic coding with numerical example. [8]
- b) Execute Huffman coding for the following source emitting 4 symbols a, b, c and d with probability 0.3, 0.2, 0.3 and 0.2 respectively. [8]
- Q2)** a) What is Linear Predictive coding'? Explain the lossy compression using predictive coding. [8]
- b) What are uniform quantizers'? Give one example for uniform quantizer. How will you select a step size? [8]
- Q3)** a) Explain 1 bit adaptive quantizer. What is a backward quantizer? [8]
- b) What is companding'? Why is it useful for speech? Explain companded quantizer. [10]

P.T.O.

- Q4)** a) Explain delta modulation for speech. What is the advantage of using adaptive delta modulation? [8]
- b) Explain NRZ format for PCM. What is the difference between 8 bit and 16 bit PCM? [8]

SECTION - II

- Q5)** a) Explain compression algorithms used for music signals. What are features of music? [8]
- b) What is MIDI? What are applications of MIDI? [8]
- Q6)** a) What is rate distortion coding? How will you do engineering compromise on rate and distortion? [8]
- b) What is information? Is it related to entropy? Explain any one entropy coding. [8]
- Q7)** a) Explain WT decomposition for any image using Haar wavelet. What is a detail function and a low resolution function? [8]
- b) Explain sub band coding. How is it advantageous? Can we use sub band coding for speech? [10]
- Q8)** a) Explain compression of image using DCT. How will you decide a step size to compress the image? [8]
- b) What is EZW coding? Explain the algorithm for EZW coding. [8]



Total No. of Questions : 8]

SEAT No. :

P4909

[Total No. of Pages : 2

[5155]-35

M.E. (I.T.)

HIGH PERFORMANCE COMPUTER NETWORKS

(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 indicate full marks.*
- 5) Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Explain various delays in communication links. [8]
b) Explain Quality of service in HPCN. [8]
- Q2)** a) Explain architecture of Gigabit Ethernet. [8]
b) Describe standards of gigabit Ethernet with relevant applications. [8]
- Q3)** a) What are ISDN Interface, Functions and services? [10]
b) Explain techniques of frame relay congestion control. [8]
- Q4)** a) Draw and explain the ATM architecture in detail. [10]
b) What are the driving forces and need to bring in B-ISDN in to the market. [8]

P.T.O.

SECTION - II

- Q5)** a) Compare different techniques of DSL technologies. [8]
b) What is DSL technology? What are the services provided by telephone companies using DSL? [8]
- Q6)** a) Explain DWDM in detail. [8]
b) Explain advantages and disadvantages of WLAN. [8]
- Q7)** a) Explain Wi-Fi and Wi-Max in detail with practical example. [8]
b) Explain the architecture of Storage Area Network with diagram. [10]
- Q8)** Write short notes on (Any 3) : [18]
a) UMTS.
b) Applications of ISDN.
c) SONET architecture.
d) EDGE technology.



Total No. of Questions : 8]

SEAT No. :

P3858

[5155]-101

[Total No. of Pages : 3

M.E. (Civil) (Construction and Management)
APPLICATIONS OF STATISTICAL METHODS IN
CONSTRUCTIONS
(2013 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Each question carries 10 marks.*
- 2) *Solve any 5 questions out of 8.*
- 3) *Neat diagrams must be drawn wherever necessary*
- 4) *Figures to right indicate full marks.*
- 5) *Use of logarithmic tables, slide rule, electronic pocket calculator and statistical tables is allowed.*
- 6) *Assume suitable data, if necessary.*

Q1) a) A box contains 2000 components of which 5% are defective. A second box contains 500 components of which 40% are defective. Two other boxes contain 1000 components each with 10% defective components. We select at random one of the above boxes and draw from it at random a single component. What is the probability that this component is defective? **[6]**

b) Explain the addition and product rule of probability. **[2 + 2]**

Q2) a) Explain the following **[4]**

- i) Normal probability distribution.
- ii) Poisson's probability distribution.
- iii) Gamma probability distribution.

b) If the probability that an individual suffers a bed reaction due to a certain injection is 0.1%, determine the probability that out of 2000 individuals; **[6]**

- i) Exactly 3
- ii) More than 2 individuals will suffer a bed reaction

Q3) a) Explain the significance of the following in construction management: **[6]**

- i) Standard deviation
- ii) Coefficient of variance
- iii) Range

b) Explain the various test for goodness of fit. **[4]**

P.T.O.

- Q4) a)** Demand for number of cement bags for first 10 months on a construction project was found to vary from month to month. In a sample study the following information was obtained for first ten months. [7]

Months	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct
No, of cement bags	10240	10205	10100	10200	10026	10150	10250	10325	10500	10045

Use χ^2 - test to assess the correctness of the hypothesis that number of cement bags demanded does not depends on months. Value of χ^2 for 5 degree of freedom at 5% level is 11.07

- b) Explain the various statistical tools used in construction with examples.[3]

- Q5)** Find regression equation for the following data and determine the value of y for x = 30 and x for y = 32 [8 + 2]

X	18	20	21	23	27	26	27	28	28	32
Y	16	18	20	22	19	24	24	23	25	27

- Q6) a)** Determine Spearman's rank correlation coefficient based on the following data. [5 + 1]

Items	Points given by quality manager	Points given by sr. site engineer
Excavation	9	8
PCC	10	8
RCC	6	7
Plumbing	10	7
Plastering	6	5
Waterproofing	7	8
Woodwork	4	5
Electrification	7	7
Brickwork	7	6
Water tank	8	9

Also interpret the same.

- b) Explain the applications of sensitivity analysis in construction management. [4]

- Q7)** a) Explain the different types of correlation coefficients with construction examples. [5]
- b) Explain Griffi's mathematical model with 2 construction examples. [5]

Q8) A contractor has kept the data for last 5 projects related to duration required to complete it. Using Monte Carlo simulation, simulate the mean duration for his next 10 projects. [10]

Project No.	Duration
1	30
2	12
3	10
4	08
5	35

Use following random numbers.

63 78 87 47 56 22 19 16 78 03 04 61 23 15 58

x x x

Total No. of Questions : 8]

SEAT No. :

P3859

[5155]-102

[Total No. of Pages :2

M.E. (Civil) (Construction & Management)
MANAGEMENT & PROJECT PLANNING IN CONSTRUCTION
(2013 Credit Pattern) (Semester - I) (501022) (End Sem.)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All Questions Carry 10 Marks Each.*
- 2) *Attempt any five questions out of Eight.*
- 3) *Neat Diagrams must be drawn wherever necessary.*
- 4) *Assume Suitable data, if necessary.*
- 5) *Figure to the right indicate full marks.*
- 6) *Use of Electronic calculator is allowed.*

Q1) a) What do you mean by modern scientific management? **[5]**

b) Write short note on: Management styles. **[5]**

Q2) a) State various types of organization. Explain any one in detail. **[5]**

b) Write short note on : Role of Project management consultant. **[5]**

Q3) Write short note on: **[10]**

a) Repetitive Project Scheduling.

b) CPM & PERT.

Q4) a) What is resource smoothing and resource leveling? Differentiate with example. **[5]**

b) Discuss in detail various types of cost involved in a construction project. **[5]**

P.T.O.

- Q5)** a) What do you mean by MIS. Discuss the need and objectives of MIS in infrastructure projects? [5]
- b) Explain the necessity of training to construction managers. [5]
- Q6)** a) What do you mean by performance rating. Discuss in detail any two rating techniques. [5]
- b) What are the objectives of method study? Discuss various steps involved in method study. [5]
- Q7)** a) Explain in detail various safety policies & safety measures to be adopted on construction site. [5]
- b) Write short note on: Workmen Compensation act. [5]
- Q8)** a) Define the term merit rating. Explain any two methods of it. [5]
- b) What are the objectives of job evaluation? Explain point method in detail. [5]



Total No. of Questions : 8]

SEAT No. :

P3860

[5155]- 103

[Total No. of Pages : 2

M.E. (Civil) (Construction and Management)
CONSTRUCTION TECHNOLOGY
(2013 Pattern) (Semester - I)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide rule, Moiller charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data / information wherever necessary.*

Q1) With the help of appropriate sketches, classify pile foundations based on materials and structural action. Discuss the steps involved in construction of any one type of pile classified earlier with neat labelled figures. **[10]**

Q2) With the help of neat labeled sketches, draw a layout of a RMC plant to be used for concrete road construction. Enlist and discuss the points to be considered for setting up of RMC plants for highway construction projects. Justify with suitable examples how RMC can be a JIT inventory management technique in construction projects. **[10]**

Q3) Explain the concept and application of coffer dam construction. Based on the application listed above, with the help of neat labeled sketch discuss the points to be considered in site layout and construction of the coffer dam. **[10]**

Q4) Discuss in detail with appropriate sketches the construction procedure of pneumatic caissons. Explain the term caissons disease and enlist appropriate measures to take care of the construction crew against caissons disease. **[10]**

Q5) Explain the term depreciation of construction equipments. Enlist and explain different methods of depreciation of construction equipments. **[10]**

P.T.O.

Q6) In case of a Power Shovel: **[10]**

- a) List out the factors which affect the output of a Shovel.
- b) Enlist and explain in brief the elements involved in Work cycle of the Power Shovel.
- c) What is the effect of angle of swing on the output of the Shovel?

Q7) Explain the concept of under-water concreting. Discuss in detail any two methods with suitable sketches. State the applications of this procedure. **[10]**

Q8) Write short notes on:

- a) Material Handling Equipments in Construction Industry. **[3]**
- b) Spare part management and inventory control **[4]**
- c) Equipment Documentation and its importance. **[3]**



Total No. of Questions : 8]

SEAT No. :

P3861

[5155]- 104

[Total No. of Pages : 2

M.E. (Civil) (Construction Management)
RESEARCH METHODOLOGY TREATMENT
(2013 Pattern) (Semester - I)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Solve any five questions.*
- 2) *Figures to the right indicate full marks.*

Q1) a) Explain the techniques involved in defining a research problem. [5]

b) Discuss the general objectives of research funding agency. [5]

Q2) a) Discuss in brief the format of a research report. [5]

b) Distinguish the errors encountered in selecting a research problem. [5]

Q3) a) Explain sources of secondary data. [5]

b) Explain in brief the important scaling techniques. [5]

Q4) a) Why should the data collected for research must be checked for reability , suitability and adequacy? [5]

b) Explain the importance of a good literature review. [5]

Q5) a) Write a note on cluster Analysis. [5]

b) Explain the steps to be followed for discriminant analysis. [5]

Q6) a) Discuss the important characteristics of Chi-Square test. [5]

b) Explain the centroid method of factor Analysis. [5]

P.T.O.

Q7) a) Discuss the important considerations for publishing the research in a journal paper. [5]

b) Write the format to be followed for a research report. [5]

Q8) Write a research proposal for a suitable research problem (any problem related to Civil engineering can be considered) to a funding agency with reference to the following terms:

Title, Introduction, origin of the problem, expected outcome, literature review, Significance of the study in the context of current status, objectives, methodology, year wise plan. [10]



Total No. of Questions : 8]

SEAT No. :

P3862

[5155]-105

[Total No. of Pages : 2

M.E.(Civil) (Construction and Management)
CONSTRUCTION CONTRACTS ADMINISTRATION AND
MANAGEMENT
(2013 Pattern) (Semester-II) (End Sem.) (501026)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Solve any 5 questions out of 8.*
- 2) Each question carries 10 marks.*
- 3) Neat diagrams must be drawn whenever necessary.*
- 4) Figures to the right side indicate full marks.*
- 5) Assume Suitable data if necessary.*

Q1) What is the definition of “Consent” given by Indian Contract Act? Explain the meaning of free consent and each condition included in it. **[10]**

Q2) What are the types of claims that are relevant to Construction industry? Explain each in detail. **[10]**

Q3) a) Differentiate between disputes and claims by giving suitable example. **[4]**

b) What do you mean by Alternate Dispute Resolution? What are its advantages? **[6]**

Q4) a) Briefly explain FIDIC conditions of contract. Also, write a note on FIDIC Red book by giving its application. **[6]**

b) State any four circumstances which give rise to claim for extension of time. **[4]**

P.T.O.

- Q5)** a) What is the importance of ‘Comparative Statement’ after opening the tenders? Give the format for the same. [6]
b) Write a note on ‘Prequalification Requirement’. [4]
- Q6)** a) What are the powers and duties of an arbitrator? [5]
b) Explain ‘Arbitral tribunal’. What should be the contents of notice of request for arbitration? [5]
- Q7)** a) How conciliation differs from arbitration? [4]
b) Give the procedure to appeal against arbitral award. [6]
- Q8)** a) Explain following terms: [6]
i) Preliminary or temporary injunction
ii) Mandatory injunction
iii) Permanent injunction
b) What are the duties and rights of bailer? [4]



Total No. of Questions : 8]

SEAT No. :

P4840

[Total No. of Pages : 2

[5155]-106

M.E. (Civil) (Construction & Management)
PROJECT ECONOMICS & FINANCIAL MANAGEMENT
(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Solve any 5 questions out of 8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Each questions carry 10 marks.*
- 4) *Assume suitable data whenever necessary.*
- 5) *Use of electronic pocket. Calculator is allowed.*

Q1) a) Discuss the various obstacles to growth of any civil engineering firms. **[4]**

b) Discuss the objectives of financial management and explain concept of financial discipline with an example. **[6]**

Q2) a) A construction company invested Rs. 60 lacs in a Paver Machine, its useful life is four years. Find discounted payback period at 12% cost of capital & NPV at 15%, if the return froms equipment as follows. **[6]**

Year	1	2	3	4
Returns	12,00,000	22,00,000	30,00,000	20,00,000

b) Write a short notes on Credit Management. **[4]**

Q3) a) Compute the internal rate of return and comment on the project for the following details of a company. Capital investment of Rs 20,00,000 & profit for six years at a rate of Rs.4,00,000 per annum. The choices of discounting rates are 12%, 14%, 16% **[6]**

b) Explain suitable example, how does the use of financial leverage affect the breakeven point. **[4]**

Q4) a) Define debentures, loan capital and bonus share with example. **[6]**

P.T.O.

b) Discuss microfinancing in relation with commercial housing projects. [4]

Q5) a) Explain the procedure of preparing master Budget. [5]

b) Explain use of budgetary control system in construction industry. [5]

Q6) a) Discuss the CIDC-IRA grading in construction entities. [3]

b) An investment proposal requires an initial capital of Rs.40,00,000 with no salvage value, and will be depreciated on a straight line basis for tax purpose. [7]

'Earning before depreciation & taxes' (EBDT) during its five year life are-

Year	1	2	3	4	5
EBDT(RS)	1,40,000	1,52,000	1,60,000	1,20,000	1,04,000

Corporate tax is 35%, company evaluates investment project at 12% cost of capital. Whether project should be accepted when there is no inflation.

Q7) a) Explain the utility of any five ratio in financial planning, analysis and control. [5]

b) Prepare daily report format of metro construction site. [5]

Q8) Discuss in brief about case study of BRT project in Pune city also discuss different challenges in future development. [10]



Total No. of Questions : 8]

SEAT No. :

P3863

[5155]-107

[Total No. of Pages : 3

M.E. (Civil) (Construction and Management)
OPERATIONS RESEARCH
(2013 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables, slide rule, Moiller charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data, information wherever necessary.*

- Q1)** a) Enlist and explain various phases involved in Operation Research. [5]
b) Enlist various models adopted in Operations Research. Discuss the limitations of Operations Research. [5]

- Q2)** Using two phase method solve the following, [10]

$$\text{Min. } z = x_1 + x_2$$

Subject to:

$$2x_1 + x_2 \geq 4$$

$$x_1 + 7x_2 \geq 7$$

- Q3)** Using Transportation problem solve the following to obtain optimum solution; [10]

	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	

P.T.O.

Q4) a) Find maximum of $f(x) = x(1.5 - x)$ in the interval of (0, 1) within 10% accuracy using Dichotomous search technique. **[5]**

b) Minimize $z = (x_1 - x_2)^2 + 2(x_2 - 1)^2$ starting with $x^0 = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$ Use steepest Gradient Method. **[5]**

Q5) a) Maximize $Z = x_1^2 + 3x_2^2 + 2x_1x_2 + 2x_1 + 6x_2$, subject to $2x_2 - x_1 = 4$. Use Lagrange Multiplier Technique. **[5]**

b) With respect to Dynamic Programming, explain the following terms, State, Stage, Return Function and Bellman's principle of Optimality. **[5]**

Q6) a) Workers come to cement store room to receive cement bags for a construction operation. The average time between two arrivals is 60 sec. and the arrivals follow Poisson distribution. **[6]**

The average service time is 40 sec. Determine;

- i) The average queue length
- ii) Average length of workers in the system
- iii) Average number of workers in a system including the worker being attended
- iv) Mean waiting time of an arrival

b) State and discuss the Kendalls notations for single channel queuing theory. **[4]**

Q7) A sample of 100 vehicles arrive at a toll booth. The distribution is as follows; **[10]**

Time of arrival (min.)	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Frequency	2	6	10	24	20	15	10	7	4	2

The study of service time indicates following distribution

Service time (min.)	0.5	1	1.5	2	2.5
Frequency	13	22	37	20	20

Estimate the average waiting time, the percentage waiting time of the vehicle, average idle time and % idle time of the server for 10 arrivals. Use following random numbers;

Arrival	16	77	23	02	77	28	06	24	25	93
Service	56	65	05	61	86	90	92	10	79	80

Q8) Explain the concept of;

[10]

- a) Big M method.
- b) Duality in Linear Programming Problem.

x x x

Total No. of Questions : 8]

SEAT No. :

P3864

[5155]- 108

[Total No. of Pages : 2

M.E. (Civil) (Construction Management)
ENVIRONMENT AND ENERGY FOR SUSTAINABLE
CONSTRUCTION
(2013 Pattern) (Semester -III)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt any 5 questions.*
- 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.*

- Q1)** a) Discuss the pollution potential of construction projects. With suitable example justify whether the water resources project project can be made environmentally sustainable. **[5]**
- b) Explain with suitable example importance of anaerobic wastewater treatment systems under Indian environmental conditions. **[5]**
- Q2)** a) Discuss various initiatives undertaken at National and international level for climate finance. **[5]**
- b) Discuss the energy sector scenario in India. Explain in detail the importance of developing non conventional energy sources in India under current scenario of global warming and climate change. **[5]**
- Q3)** a) Explain the importance of participatory approach and community involvement in making a village environmental friendly from waste management point of view. **[5]**
- b) With suitable examples, explain two sustainable construction principles that can be adopted in a Smart City Project. **[5]**

P.T.O.

- Q4)** a) Explain how green buildings can fetch carbon credits to the owner. [5]
b) Explain in detail the concept climate resilient built environment. [5]
- Q5)** a) Explain recent developments in solar energy sector in India. Support your answer with suitable examples. [5]
b) One of the measures of sustainable practices in built environment is Total Building Performance (TBP). Enlist and explain different components involved in TBP. [5]
- Q6)** a) Explain in detail smart water conservation techniques adopted in multi storeyed buildings. [5]
b) Explain the concept of low carbon buildings. Enlist and explain any three construction practices that lead to low carbon buildings. [5]
- Q7)** a) Explain with suitable sketch the engineering of hollow roof system. Highlight the sustainability aspect of this design. [5]
b) Discuss in detail the components, losses and efficiency factors related to building energy management system. [5]
- Q8)** a) Enlist and explain the low cost technology measures that can be adopted to regulate and improve the energy performance of built environment. [5]
b) Discuss in detail the different engineering and design philosophies to be adopted to regulate indoor air temperature without the use of air conditioning units. [5]



Total No. of Questions : 8]

SEAT No. :

P4851

[Total No. of Pages : 2

[5155]-109

M.E. Civil (Construction & Management)

TQM IN CONSTRUCTION

(2013 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All Questions Carry 10 Mark Each.*
- 2) *Attempt any five question out of Eight.*
- 3) *Neat Diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data if necessary.*
- 5) *Figure to the right indicate full marks.*
- 6) *Use of Electronic calculator is allowed.*

Q1) a) Give various definition of quality and explain their meaning in context to construction sector [5]

b) Discuss in detail various factor affection quality of construction. [5]

Q2) a) Write short note on : Destructive & Non Destructive testing. [5]

b) Explain with example applications of dispersion method in quality control of construction activities. [5]

Q3) Discuss in detail various technical & managerial competencies required for achieving quality. [5+5]

Q4) a) Discuss in detail the role & responsibility of Quality inspection team.[5]

b) Explain the importance of quality circles for successful implementation of TQM principles. [5]

P.T.O.

- Q5)** a) How will you apply ISO principles in construction company. [5]
b) What is the difference between ISO 9001 & ISO 9004. [5]
- Q6)** a) Discuss advantages of implementing TQM principles in the construction sector. [5]
b) Discuss in detail the concept of QFD. [5]
- Q7)** a) Explain Six Sigma Problem solving method. [5]
b) How will you apply six sigma concepts in quality improvement programme? [5]
- Q8)** Discuss in detail application of six sigma tool in following. [5 + 5]
i) RCC work in buildings
ii) Road construction



Total No. of Questions : 8]

SEAT No. :

P3865

[5155]-110

[Total No. of Pages : 1

M.E. (Civil) (Environmental Engineering)
ENVIRONMENTAL LEGISLATION AND MANAGEMENT
SYSTEMS
(2013 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat figures whenever necessary.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of scientific calculator is allowed.*

Q1) Discuss the polluter pay principle and concept of absolute liability. **[10]**

Q2) Discuss the provisions for closure of Industry as per Water (p&cp) Act 1974. **[10]**

Q3) Discuss the provisions for closure of Industry as per Air (p & cp) Act 1981. **[10]**

Q4) Discuss the EIA notification and its amendments under Environmental (Protection) Act 1986. **[10]**

Q5) Discuss the principles and elements of ISO 14000 series. **[10]**

Q6) Discuss the role of Judiciary and NGO in Environmental Protection with supreme Court Judgement in Landmark cases. **[10]**

Q7) Discuss the role of MPCB in implementation of various notifications issued by the Govt. of India. **[10]**

Q8) Discuss the role of NGO in nature conservation. **[10]**

x x x

Total No. of Questions : 8]

SEAT No. :

P3866

[5155]-111

[Total No. of Pages :1

M.E. (Civil) (Environmental Engineering)
ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY
(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.*
- 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.*

Q1) State various methods of analysis in Environmental Engg. **[10]**

Q2) Explain the physical processes of formation pollutants in atmosphere. **[10]**

Q3) What is mean by surfactant, Give classification of detergents and explain each in detail. **[10]**

Q4) Discuss the various mechanism of polymer decay. **[10]**

Q5) Explain difference between Gas Chromatography and liquid Chromatography. **[10]**

Q6) Explain microbial cell structure with sketch. **[10]**

Q7) Write a note on staining techniques. **[10]**

Q8) What is 'Bioremediation of contaminated soil' and explain its principle and microbiology **[10]**



Total No. of Questions : 8]

SEAT No. :

P3867

[5155]- 112

[Total No. of Pages : 2

M.E. (Civil) (Env. Engg.)

**PHYSICO CHEMICAL PROCESSES FOR WATER AND WASTE
WATER TREATMENT**

(2013 Pattern) (Semester - I)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Draw neat figures wherever necessary.*
- 3) *Use of Scientific Calculator is allowed.*
- 4) *Assume suitable data if necessary clearly mentioning the same.*
- 5) *Solve any Five Questions.*

Q1) Explain the Mass-Balance Principle. Discuss Reactions kinetics and reaction rates. Also highlight on Configurations of ideal and non-ideal reactors. **[10]**

Q2) Compare: **[10]**

- a) Repulsive and Attractive Potentials
- b) Orthokinetic and Perikinetic flocculation.

Q3) Discuss Adsorption processes, types of adsorption, factors influencing adsorption and adsorption isotherms. **[10]**

Q4) Explain the principle of sedimentation. Mention various factors responsible for sedimentation and give design parameters for sedimentation tank design. **[10]**

Q5) Design an aerated grit chamber for the treatment of municipal wastewater. The average flow rate is 0.5 m³/s. Take peak factor as 2.75. **[10]**

P.T.O.

Q6) Explain Rotating Biological Contractor with respect to following points. **[10]**

- a) Concept
- b) Removal Mechanism
- c) staging and
- d) design consideration.

Q7) Mention and define various design parameters in case of Activated sludge process. **[10]**

Q8) Differentiate between:

- a) Differentiate between stabilization pond and aerated lagoon. **[5]**
- b) Differentiate between Activated sludge process and Trickling filter. **[5]**



Total No. of Questions : 8]

SEAT No. :

P3868

[5155]- 113

[Total No. of Pages : 2

M.E. (Civil) (Environmental Engineering)
RESEARCH METHODOLOGY
(2013 Pattern) (Semester - I)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Solve any FIVE questions.*
- 2) *Figures to the right indicates full marks.*

Q1) a) Explain the techniques involved in defining a research problem. **[5]**

b) Discuss the general objectives of research funding agency. **[5]**

Q2) a) Discuss in brief the format of a research proposal. **[5]**

b) Identify the ethical issues related to interpretation and reporting a research problem. **[5]**

Q3) a) Write a note on “Sources of literature review”. **[5]**

b) Differentiate between Random sampling and Non-Random sampling. **[5]**

Q4) a) Why should the data collected for research must be checked for reability , suitability and adequacy? **[5]**

b) Explain type I and type II errors in hypothesis testing. **[5]**

Q5) a) Write a note on Discriminant Analysis. **[5]**

b) Write a note on Multicollinearity. **[5]**

Q6) a) Discuss the important characteristics of Chi-Square test. **[5]**

b) Explain the centroid method of factor Analysis. **[5]**

P.T.O.

Q7) a) Discuss the prerequisites for publishing the research in a journal paper. **[5]**

b) Explain the significance of a research report. **[5]**

Q8) Write a research proposal for a suitable research problem (any problem related to Civil engineering can be considered) to a funding agency with reference to the following terms:

Title, Introduction, origin of the problem, expected outcome, literature review, Significance of the study in the context of current status, objectives, methodology, year wise plan. **[10]**



Total No. of Questions : 8]

SEAT No. :

P3869

[5155]-114

[Total No. of Pages : 2

M.E.(Civil-Environmental Engineering)
INDUSTRIAL WASTE WATER MANAGEMENT
(2013 Pattern) (Semester-II)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any 5 questions.*
- 2) *Each question carries equal marks.*
- 3) *Figures to the right side 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.*

Q1) Give the note on Prevention Vs control of industrial Pollution. **[10]**

Q2) Explain the followings: **[10]**

- a) Oil Separation
- b) Flotation and Precipitation

Q3) Discuss in detail with suitable sketch about membrane separation process. **[10]**

Q4) Discuss in details about Special Treatment Methods for Chemical oxidation. **[10]**

Q5) Explain Manufacturing process of fertilizer industry and give the characteristics of effluent. **[10]**

P.T.O.

Q6) Discuss Characteristics and composition of effluent from Sugar industry.[10]

Q7) Give the detail note on Zero Effluent Discharge System. [10]

Q8) Discuss the polymer coagulation treatment system. [10]



Total No. of Questions : 8]

SEAT No :

P 3870

[5155]-115

[Total No. of Pages :2

**M.E. (Civil - Environmental Engineering)
AIR POLLUTION AND CONTROL
(2013 Course) (Semester-II) (501067)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Solve any five questions.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat figures wherever necessary.*
- 4) Assume necessary data.*
- 5) Use of scientific calculators is allowed.*

Q1) a) Explain the effect of PM_{2.5} and PM₁₀ on human beings. **[5]**

b) Explain effects of air pollution on material. **[5]**

Q2) a) Enlist different zones of atmosphere and explain its significance with respect to air pollution. **[5]**

b) Explain effect of topography on pollutant dispersion. **[5]**

Q3) a) Write short note on Gaussian model. **[5]**

b) Write short note on MMD. **[5]**

Q4) a) What are the different methods to control air pollution at source? **[5]**

b) Write principle and design parameters to control air pollution through cyclones. **[5]**

P.T.O.

- Q5)** a) Write difference between absorption and adsorption to control gaseous pollutants. [5]
b) Write a short note on automobile pollution and its control. [5]
- Q6)** a) Explain environmental guidelines for siting of industries. [5]
b) Write a short note on ambient air quality monitoring in India. [5]
- Q7)** a) What are the emission from vehicle and its impact on environment? [5]
b) Write short note on measurement of odour. [5]
- Q8)** a) Write effects of indoor air pollution. [5]
b) Write short note on air cleaning system. [5]



Total No. of Questions : 9]

SEAT No. :

P3871

[5155]-116

[Total No. of Pages :1

M.E. (Civil - Environmental Engineering)
SOLID WASTE & HAZARDOUS WASTE MANAGEMENT
(2013 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any 5 questions.*
- 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 tables is allowed.*

Q1) Discuss in details the environmental impact of mismanagement of solid waste. **[10]**

Q2) Explain the economic analysis of Solid Waste Management system in detail. **[10]**

Q3) Give the note on. **[10]**
a) Stages of sorting.
b) Commingled solid waste.

Q4) Explain the factors affecting the composting of solid waste in details. **[10]**

Q5) Explain the scientific land filling with suitable sketch. **[10]**

Q6) Discuss about Leachate and landfill gas management. **[10]**

Q7) Discuss the functional elements of solid waste management system. **[10]**

Q8) What are the disposal options are available for safe disposal of nuclear and radio active wastes. **[10]**

Q9) Explain the Toxicity Characteristic Leaching Procedure (TCLP). **[10]**



Total No. of Questions : 8]

SEAT No. :

P3872

[Total No. of Pages : 1

[5155]-117

M.E. (Civil - Environmental Engineering)

ENVIRONMENTAL SANITATION

(2013 Course) (Semester-III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** Discuss Communicable diseases? How the micro-organisms plays role in the system. **[10]**
- Q2)** Discuss plague control methods how they are effective in control of plague. **[10]**
- Q3)** Discuss in details the sanitation system for **[10]**
- a) Eating establishments
 - b) Swimming pools
- Q4)** Discuss the followings **[10]**
- a) Occupational Hazards
 - b) Industrial poisons
- Q5)** Discuss with suitable example about low cost excreta disposal systems. **[10]**
- Q6)** Discuss in detail about Rural sanitation improvement schemes. **[10]**
- Q7)** Discuss the followings. **[10]**
- a) Selection of water pipes
 - b) Lay of water supply system in building
- Q8)** Explain in details. **[10]**
- a) Choice of system
 - b) Interceptors



Total No. of Questions : 8]

SEAT No. :

P3873

[5155]-118

[Total No. of Pages : 1

M.E. (Civil) (Environmental Engineering)
ENVIRONMENTAL IMPACT ASSESSMENT
(2013 Course) (Semester - III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions.*
- 2) Figures to the right indicate full marks.*
- 3) Draw neat figures whenever necessary.*
- 4) Assume suitable data, if necessary.*
- 5) Use of scientific calculator is allowed.*

Q1) Discuss the various steps in obtaining the prior environmental clearance as per EIA notification of Govt. of India. **[10]**

Q2) Discuss the various environmental indicators for describing affected environment. Also explain the Life Cycle Assessment. **[10]**

Q3) Discuss the prediction, assessment and mitigation measures for air environment. **[10]**

Q4) Discuss the prediction, assessment and mitigation measures for water environment. **[10]**

Q5) Discuss the Impact prediction and assessment of socioeconomic impact. **[10]**

Q6) Discuss the importance of public participation in environmental decision making. **[10]**

Q7) Discuss the EMP and post Environmental monitoring. **[10]**

Q8) Discuss the important provisions in EIA notification of 2006 of Govt. of India. **[10]**



Total No. of Questions : 8]

SEAT No. :

P3874

[5155]-119

[Total No. of Pages : 2

M.E. (Civil) (Geotechnical Engineering)
ADVANCE SOIL MECHANICS
(2013 Course) (Semester - I) (501121)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any 5 questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions carry equal marks.*
- 5) *Your answers will be valued as a whole.*
- 6) *Assume suitable data, if necessary.*

Q1) Derive the compatibility equation in terms of Airy's stress function. Explain the meaning of various terms. **[10]**

Q2) What is contact pressure? Explain the contact pressure distribution in **[10]**

- a) Cohesive soils and
- b) Cohesion less soils over the base of footings.

Also Explain the effect of non-uniform distribution of contact pressure on the design of footings

Q3) What is stress path? Explain the stress path for the drainage conditions **[10]**

- a) Total stress path
- b) Effective stress path

Q4) Explain various type of retaining walls used in construction How, stability analysis is carried out with respect to **[10]**

- a) Sliding
- b) Overturning
- c) Bearing capacity

P.T.O.

- Q5)** Explain the Culmann's wedge theory for estimation of active earth pressure on retaining wall. **[10]**
- Q6)** Derive the three-dimensional consolidation equation using Terzaghi's theory and state the assumptions made. **[10]**
- Q7)** Explain the directional variation of permeability in an anisotropic soil medium. **[10]**
- Q8)** Derive an equation to calculate the seepage discharge through anisotropic soil using the transform field and actual field flow nets. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P3875

[5155]-120

[Total No. of Pages :1

M.E. (Civil) (Geotechnical Engineering)
GROUND IMPROVEMENT TECHNIQUES
(2013 Pattern) (501122) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Draw neat figures wherever necessary.*
- 3) *Use of Scientific Calculators is allowed.*
- 4) *Attempt any 5 questions.*
- 5) *Assume Suitable data if necessary clearly mentioning the same.*

- Q1)** a) Discuss characteristics of clay minerals for its identification. [5]
b) Write short note on : Electrical Effects. [5]
- Q2)** Discuss the engineering properties and behaviour of chemically stabilised soils. [10]
- Q3)** a) Write short note on effectiveness of lime stabilisation. [5]
b) Explain laboratory testing of cement stabilised soil. [5]
- Q4)** a) How is flyash and slag used for stabilisation? Explain in detail. [5]
b) Classify bituminous stabilisation along with its mechanism in detail. [5]
- Q5)** Describe in detail how thermal and electro kinetic stabilisation is carried out. [10]
- Q6)** Explain dynamic consolidation and compaction piles. [10]
- Q7)** a) Write short note on bearing capacity of lime group. [5]
b) Discuss the design criteria for lime column foundations. [5]
- Q8)** a) Explain permeation and hydro fracture grouting. [5]
b) Explain types of grouts. [5]



Total No. of Questions : 8]

SEAT No. :

P4852

[Total No. of Pages : 2

[5155]-121

M.E. (Civil) (Geotechnical Engineering) (Semester - I)

ROCK MECHANICS

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any 05 Questions from 08 questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data if necessary.*
- 5) *Neat diagrams must be drawn wherever necessary.*

Q1) a) Enlist various field of application of rock mechanics and explain any one in detail. **[4]**

b) Discuss the classification of rock for engineering purpose. Explain RMR by using strength of rock. **[6]**

Q2) a) Write a note on following: **[4]**

i) Rock bolting

ii) Rock anchoring

b) Enlist the various types of rock blasting and explain the cushion blasting in detail. **[6]**

Q3) a) Explain the influence of initial stresses in rock and their measurement. **[4]**

b) Discuss the hydraulic fracturing method to estimate the stress in rock. **[6]**

P.T.O.

- Q4)** a) Write a note on elastic and non elastic behavior of rock. [4]
b) Explain the determination of deformability of rock by plate bearing test.[6]
- Q5)** a) Write a note on Griffith's theory of fracture initiation in rock masses.[4]
b) Discuss the factors affecting the fracture behavior of rock. [6]
- Q6)** a) Write a note on structural discontinuities in rock masses. [4]
b) Explain the principal of limit equilibrium method for the analysis of rock structure. [6]
- Q7)** a) Enlist various modes of failure of footings on rock. Explain any one in detail. [4]
b) Write a note on stresses and deflection of rock under footing. [6]
- Q8)** a) Write a note on plastic behavior of rock around tunnel. [4]
b) Explain the rock slopes with reference to modes of failure and factors affecting. [6]



Total No. of Questions : 8]

SEAT No. :

P4841

[Total No. of Pages : 2

[5155]-122
M.E. (Civil) (Geotech)
RESEARCH METHODOLOGY

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions out of eight questions.*
- 2) Each question carries ten marks.*

- Q1)** a) State and explain the various steps of research process.
b) Explain the process of formulation of research hypotheses.

- Q2)** a) Write a short note on research proposal.
b) What is the need of literature survey?

- Q3)** a) Elaborate the styles and strategies of literature review.
b) Describe various data collection methods and discuss the factors affecting their choice.

- Q4)** a) Discuss the criteria of good measurements and their significance.
b) Which are the statistical measures used for data analysis.

- Q5)** a) What is ANOVA (analysis of variance) test? In which situation is it useful?
b) Differentiate between qualitative and quantitative data analysis.

- Q6)** a) What is regression analysis? In which situation is it used?
b) Explain the concept of factor analysis.

P.T.O

Q7) a) Explain various steps involved in report writing.

b) Write a short note on plagiarism.

Q8) a) Describe various styles and elements of effective presentation.

b) What is patenting? How is it useful to society?



Total No. of Questions : 8]

SEAT No. :

P4853

[Total No. of Pages : 3

[5155]-123

M.E. (Civil) (Semester - II)

**ADVANCE FOUNDATION ENGINEERING
(2013 Pattern) (Geotechnical Engineering)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any 05 Questions from 08 questions.*
- 2) *Figures to the right indicate full marks*
- 3) *Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data if necessary.*
- 5) *Neat diagrams must be drawn wherever necessary.*

- Q1) a)** Explain the following methods with help of neat sketch. **[4]**
- i) Wash boring method
 - ii) Percussion drilling method
- b) Determine the recovery ratio and area ratio of the sampler used to obtain the soft soil sample with following details. **[6]**
- i) Diameter of borehole 150 mm.
 - ii) The sampler has inside and outside diameter 68.5 mm & 72.5mm respectively.
 - iii) The length of sampler is 600mm and actual sample recovered is 565mm. Also comment about the soil sample obtained in the process.

- Q2) a)** Write a note on following : **[4]**
- i) Electrical sounding method
 - ii) Seismic refraction method

P.T.O.

- b) A laboratory vane shear test was conducted in soft clay. The height and diameter of the vanes were 12mm and 24mm, respectively. During the test the angle of twist observed was 95.6° and $K = 8 \text{ N/m}$. Compute the undrained shear strength of the clay. [3]
- c) Calculate the corrected SPT number for a field test conducted on a sandy soil. [3]
- i) Observed SPT number is 18 at a depth of 1.5 m from GL
 - ii) It is also observed that water table is 1m below GL.
 - iii) Take $\gamma=18.0 \text{ kN/m}^3$ and Correction factor = 1.4

- Q3)** a) Differentiate between the Terzaghi's bearing capacity theory and Meyerhoff's bearing capacity theory. [4]
- b) A square footing of 1.5m side is laid at a depth of 1.0m below the GL. The soil strata at the site has $\gamma=18.5 \text{ kN/m}^3$, $C' = 0$ and $\phi' = 30^\circ$. Determine the net ultimate bearing capacity of the footing if, [6]
- i) the water table rises to the level of base,
 - ii) the water table rises to the GL,
 - iii) the water table is 1m below the base

- Q4)** a) Enlist various methods of raft foundation design and explain any one in detail [4]
- b) Determine the depth of mat foundation for following data : [6]
- i) Size of foundation $25\text{m} \times 35 \text{ m}$.
 - ii) The live load and dead load on mat are 200 MN.
 - iii) The mat foundation is placed over a layer of clay.
 - iv) The unit weight of clay is 18.0 kN/m^3 .

If C_u for the clay is 12.5 kN/m^2 and factor of safety is 3, also determine the depth of the foundation.

- Q5)** a) Discuss the various stability check involved in the design of cantilever sheet pile wall [4]
b) Discuss the various methods for providing anchors for a sheet pile wall. [6]
- Q6)** a) Explain the use of p-y curves pertaining to laterally loaded piles. [4]
b) Determine the negative skin friction for a pile installed in cohesive soil with pile diameter 300mm, length of pile in compressible strata 1.2 m and undrained cohesion 10 kN/ m². Take $\alpha = 1$. [6]
- Q7)** a) Write a note on cellular cofferdam. [4]
b) How will you determine bearing capacity for a cofferdam founded on soil? Enlist only the steps to be followed. [6]
- Q8)** a) Discuss the factors influencing the depth of well foundation. [4]
b) Write a note on Tilting of well foundation. [6]



Total No. of Questions : 8]

SEAT No :

P 3876

[5155]-124

[Total No. of Pages :1

M.E. (Civil) (Geotechnical Engineering)
CONSTRUCTION METHODS IN GEOTECHNICAL ENGINEERING
(2013 Course) (501127) (Semester-II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any 05 questions.
- 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, clearly mentioning the same.

Q1) a) With neat sketches describe the pile driving equipment and its accessories. **[5]**

b) Describe erection of precast piles. **[5]**

Q2) Explain circular and rectangular cofferdams with neat sketches. **[10]**

Q3) Describe bottom seal of cofferdam and its various construction techniques. **[10]**

Q4) Write short note on improper tremie concrete procedures. **[10]**

Q5) How is launching and towing of caissons done? Explain with sketches. **[10]**

Q6) a) Discuss measures to avoid sliding and tipping of poen caissons. **[5]**

b) Write short note on caisson disease. **[5]**

Q7) Write short notes on pre-splitting and trim blasting. **[10]**

Q8) Explain full face tunneling with support and without support. **[10]**



Total No. of Questions : 8]

SEAT No. :

P3877

[5155]-125

[Total No. of Pages :1

M.E. (Civil) (Geotechnical Engineering)
STABILITY OF SLOPES AND EARTH DAMS
(2013 Course) (Semester -II) (501128)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any 5 questions from each section.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) All questions carry equal marks.*
- 5) Your answers will be valued as a whole.*
- 6) Assume Suitable data, if necessary.*

- Q1)** Compass swedish circle method and Bishops method for slope stability analysis and derive the equation for factor of safety against sliding using Bishops Method. **[10]**
- Q2)** Explain the design considerations in selsmic region for an earth dam. Also, explain the IS code provisions with respect to factor of safety of an earth dam considering. With earthquake and without earthquake. **[10]**
- Q3)** Explain the casagrandes graphical method for determination of pheratic line in an earth dam in case of a) with horizontal filter and b) without filter. **[10]**
- Q4)** Explain the various zones in an earth dam with suitable sketch. Also explain significance of various zones in zoned dams. **[10]**
- Q5)** Explain various types of piezometers used in an earth dam and their functions.Explain any one pierometer in detail with sketch. **[10]**
- Q6)** What are the codal provisions of the Indian Railway for the construction of rail embankments. Draw a typical layout of rail embankment and explain the functions of various components. **[10]**
- Q7)** Explain in detail the design of geo textile reinforced wall in respect of a) Internal stability and b) External stability. **[10]**
- Q8)** What is effect of smear in drainage. Explain the remedial measures to control smear. **[10]**



Total No. of Questions : 8]

SEAT No. :

P3878

[Total No. of Pages : 2

[5155]-126

M.E. (Civil) (Geotechnical Engineering)
GEOTECHNICAL EARTHQUAKE ENGINEERING
(2013 Pattern) (Semester-III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *Your answers will be valued as a whole.*
- 5) *Use of electronic pocket calculator is allowed.*
- 6) *Assume suitable data if necessary.*

- Q1)** a) Compare 'Continental Drift & Plate Tectonics'. [5]
b) Compare 'DSHA' & 'PSHA'. [5]
- Q2)** a) Discuss 'Ground Motion Parameters'. [5]
b) Explain 'Love Waves'. [5]
- Q3)** a) Explain 'Seismic Reflection test'. [5]
b) Discuss 'Effect of local site conditions' on ground motion. [5]
- Q4)** a) Discuss 'Ground Response Analysis'. [5]
b) Explain 'Green's Function Techniques'. [5]
- Q5)** a) Discuss 'Liquefaction'. [5]
b) Explain 'Goodman & Seed Approach'. [5]
- Q6)** a) Discuss 'Seismic slope stability'. [5]
b) Explain 'Jai-Krishna' Approach. [5]

P.T.O.

- Q7)** a) Explain different soil reinforcing techniques. [5]
b) Discuss 'EQ Induced settlement'. [5]

- Q8)** a) Explain 'Grouting'. [5]
b) How will you mitigate EQ effects? [5]



Total No. of Questions : 8]

SEAT No. :

P3879

[5155]-127

[Total No. of Pages : 2

**M.E. (Civil) (Geotechnical Engineering)
GEOENVIRONMENTAL ENGINEERING
(2013 Credit Pattern) (Semester -III) (601133)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Figure to the right indicates full marks.*
- 3) *Neat diagrams/figures/sketches must be drawn wherever necessary.*
- 4) *Assume suitable data information wherever required.*

Q1) a) Write the classification of solid waste and explain them in brief. **[5]**

b) What are the different types of gases which are produced in the landfill?
How these gases are controlled. **[5]**

Q2) a) Write the different sources of solid waste. Explain them in brief. **[5]**

b) Write a short note on
“Engineering properties and Geotechnical reuse of waste”. **[5]**

Q3) a) Write in brief the laboratory and field evaluation of permeability. **[5]**

b) What are the methods which are used for detection and control of
sub-surface containment? **[5]**

Q4) a) Explain in detail the incineration method of disposal of solid waste and
write the advantages and disadvantages. **[5]**

b) What is land filling? What factors are considered for selection of site for
land filling? **[5]**

P.T.O.

- Q5)** a) What is land filling? Write the planning and design aspects which are considered for disposal of solid waste in land filling. [5]
- b) Explain in detail the mechanical composting with neat sketch. [5]
- Q6)** a) Write brief note on: [5]
- i) Ash ponds.
- ii) Tailing ponds.
- b) What are the different methods used to transport the containment? Explain them in brief. [5]
- Q7)** a) Write the classification of transformation of solid waste and explain them in brief. [5]
- b) What are the different properties of solid waste? Explain them in brief. [5]
- Q8)** a) Explain with neat sketch "Single and Double and fill". [5]
- b) How are hazardous, non-hazardous and domestic waste are identified. [5]

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Total No. of Questions : 8]

SEAT No. :

P3880

[5155]-128

[Total No. of Pages : 2

M.E. (Civil) (Hydraulics Engineering)

FLUID MECHANICS

(2013 Course) (Semester - I) (501041)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithms tables, slide rule, electronics pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) What is a flow net? What are its uses? **[4]**

b) Derive 3-D continuity equation in cylindrical polar coordinates. **[6]**

Q2) a) Derive Bernoulli's equation along a streamline. **[5]**

b) Write a short note on relaxation technique. **[5]**

Q3) a) Derive equation for stream function and velocity potential for superposition of source and sink. Draw shapes of streamlines and potential lines. **[6]**

b) An oil of viscosity 0.12 Ns/m^2 and density 900 kg/m^3 flows between two large parallel plates which are kept at a distance 20 mm apart. The maximum velocity of flow is 1.5 m/s. Determine **[4]**

i) the average velocity

ii) the discharge per meter width

Q4) a) What are analytic functions? Examine whether following functions are analytic or not

$W = 1/Z$, $W = \log_e Z$ **[4]**

b) Define Couette flow. Prove that for Couette flow the velocity distribution depends upon Pressure gradient (dp/dx) and velocity (U) **[6]**

P.T.O.

- Q5)** a) Write a short note on development of boundary layer over a flat plate. [4]
b) Discuss Karman Pohlhausen's solution for boundary layer equations. [6]
- Q6)** a) The velocity profile for laminar boundary layer flow over a flat plate is given by $\frac{u}{U_\infty} = \frac{y}{\delta}$. Find the displacement thickness, momentum thickness, energy thickness. [6]
b) Write a short note on boundary layer separation. [4]
- Q7)** a) Write a short note types of turbulent flow. [5]
b) Derive equation for speed of sound wave in terms of Bulk modulus. [5]
- Q8)** a) Derive Reynold's equation of motion. [6]
b) A rocket is traveling in air of pressure 35 kN/m² and temperature -40°C. If the Mach angle is 40°, find the Mach number and the velocity of the rocket. Take R = 287 J/kg-K and k = 1.4 [4]

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Total No. of Questions : 8]

SEAT No. :

P3881

[5155]-129

[Total No. of Pages :1

M.E. (Civil-Hydraulics)
IRRIGATION & DRAINAGE ENGINEERING
(2013 Pattern) (Semester - I) (501042)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any Five questions from Eight questions.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) Discuss transpiration and consumptive use. [5]
b) Explain soil moisture determination. [5]
- Q2)** What are the causes of soil erosion and how will you do the conservation of it? [10]
- Q3)** Explain the various elements of drip irrigation with sketch. [10]
- Q4)** Discuss in detail the cost economics of lift irrigation scheme. [10]
- Q5)** When sprinkler irrigation system will be preferred? Explain in brief the various types of sprinkler system. [10]
- Q6)** Write short notes on: [10]
a) Warabandi (Rotational water supply)
b) Onfarm structures
- Q7)** What do you mean by canal outlets? Also explain canal automation. [10]
- Q8)** Write short notes on : [10]
a) Need and purpose of drainage.
b) WMD recommendations.



Total No. of Questions : 8]

SEAT No. :

P3988

[Total No. of Pages : 2

[5155]-130

M.E. (Civil Hydraulics) (Semester - I)

PLANNING AND MANAGEMENT OF WATER RESOURCES
(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of calculator is allowed.

- Q1) a) In a lift irrigation project a choice is to be made between two pumps, with details given in table 1a. Which of these two pumps is economically superior at an interest rate of 8%. use present worth method. [5]

Table 1 a : Details of pump

Pump	Capital cost (Rs)	Annual cost (Rs)	Annual benefit(Rs)	Life (years)	Salvage value(Rs)
A	50,000.00	6,000.00	17,000.00	11	7,000.00
B	70,000.00	5,000.00	18,000.00	16	9,000.00

- b) Describe operation of an impounding reservoir in drought condition. [5]

- Q2) a) Explain aspects of water resources planning and management with reference to [5]

- i) Technical aspect,
- ii) Economical and financial aspect,
- iii) Institutional Aspects

- b) Write a short note on-inter-basin transfer of water. [5]

P.T.O

- Q3)** a) Explain cost benefit analysis of water resources project. [4]
b) Explain how to estimate Active Storage Capacity of a reservoir using. [6]
i) Mass Diagram Analyses and,
ii) Sequent Peak Analyses.
- Q4)** a) Explain in detail how to estimate the groundwater runoff from a watershed. [5]
b) Explain following approaches of water resources planning and management: [5]
i) Top-Down planning and management,
ii) Bottom-Up planning and Management,
iii) Integrated Water Resources Management.
- Q5)** a) Solve Q. 1 a using Annual Cost Method. [5]
b) Write a short note on-conjunctive use of surface and ground water. [5]
- Q6)** a) Explain spatial and temporal scales for planning and management of water resources. [5]
b) Explain the role of different bodies in water resources planning. [5]
- Q7)** a) Explain what are the benefit cost parameters. [5]
b) Write a short note on-reservoir sedimentation. [5]
- Q8)** a) Explain how to carry out planning for flood control. [5]
b) Write a short note on -Discounting techniques. [5]



Total No. of Questions : 8]

SEAT No. :

P3882

[5155]- 131

[Total No. of Pages : 2

**M.E. (Civil) (Hydraulics)
RESEARCH METHODOLOGY
(2013 Pattern) (Semester - I)**

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Solve any 5 questions.*
- 2) *Figures to the right indicates full marks.*

- Q1)** a) Explain the steps in research process. [5]
b) Explain the difference between Research Methods and Research Methodology. [5]
- Q2)** a) Enlist various Research funding agencies. Discuss about any one in detail. [5]
b) With suitable example explain Ex post facto Research. [5]
- Q3)** a) In the research process, why is the problem definition stage probably the most important stage? What are the key issues that need to be addressed at that's stage. [5]
b) What are the most commonly used scales for measurement in a research? Give examples of at least two of them. [5]
- Q4)** a) Discuss the advantages of Likert-type Scaling method. [5]
b) Explain the sources which can and /or should be used for selecting a research problem. [5]

P.T.O.

Q5) a) Explain the Null hypothesis and Alternative Hypothesis with a suitable example. [5]

b) Write a note on 'Multivariate Analysis'. [5]

Q6) a) Write a note on "Features of Factor Analysis". [5]

b) Explain Important Parametric tests for Hypothesis testing. [5]

Q7) a) Mention the different types of report, particularly pointing out of the difference between a technical report and a popular report. [5]

b) Write a note on "Importance of Patenting a research idea". [5]

Q8) Write a research proposal for a suitable research problem (any problem related to Civil engineering can be considered) to a funding agency with reference to the following terms:

Title, Introduction, origin of the problem, expected outcome, literature review, Significance of the study in the context of current status, objectives, methodology, year wise plan. [10]



Total No. of Questions : 8]

SEAT No. :

P3883

[5155]- 132

[Total No. of Pages : 2

M.E. (Civil) (Hydraulic Engg.)
OPEN CHANNEL HYDRAULICS
(2013 Pattern) (Semester - II) (501046)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithms tables, slide rule, electronics pocket calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Show that maximum velocity in a circular channel happens when $y/D = 0.81$. [6]
b) Classify hydraulic jump using the Froud No. Draw the sketch of each jump and state the energy dissipation possible. [4]
- Q2)** a) Derive Chezy's formula. Also derive relation between Chezy's 'C' and Manning's 'n'. [5]
b) Derive relation between conjugate depths for hydraulic jump on sloping floor. [5]
- Q3)** a) Explain the characteristics of M2 profile and state one example of its occurrence. [2]
b) Derive dynamic equation of Gradually varied steady flow in standard notations. [8]
- Q4)** a) A triangular channel has a side slope of 1:1 and longitudinal slope of 1/1000. Determine whether the channel is mild, steep or critical when discharge of $0.25 \text{ m}^3/\text{s}$ flows through it. Take Manning's $n = 0.015$. Also state for which range of depths the flow will be in Zone 1, Zone 2 and Zone 3. [4]
b) A rectangular channel 20 m wide flow with normal depth of 2 m with a slope of bed 1 in 6400. At a certain section, the flow depth is 3 m. How far upstream or downstream of this section will the depth be 2.6 m. Use step method and take only two steps. Take Manning's coefficient = 0.015. sketch and mention the profile. [6]
- P.T.O.**

Q5) a) Discuss the development of Muskingum method of flood routing stating the equations and algorithm. [5]

b) Derive De Marchi equation for side weir [5]

Q6) a) Route the following flood through a reach for which $K = 12h$ and $x = 0.2$. At $t = 0$ the outflow discharge is $10 \text{ m}^3/\text{s}$. Use Muskingum method. [6]

Time (h)	0	6	12	18	24	30	36	42	48	54
Inflow (m^3/s)	10	20	50	60	55	45	35	27	20	15

b) Classify the SVF profiles. [4]

Q7) a) Derive dynamic equation of uniformly progressive wave in gradually varied unsteady flow. [6]

b) Write a short note on solitary wave. [4]

Q8) a) Explain with sketches types of surges. [4]

b) Derive equation for discharge in dam break analysis. [6]



Total No. of Questions : 8]

SEAT No :

P 3884

[5155]-133

[Total No. of Pages :2

M.E. (Civil) (Hydraulics)

SEDIMENT TRANSPORT & RIVER MECHANICS

(2013 Course) (Semester-II) (501047)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Solve any Five questions from Eight questions.*
- 2) All questions carry equal marks.*
- 3) Figures to the right indicates full marks.*
- 4) Use of scientific calculator is allowed.*
- 5) Assume suitable data, if necessary.*

Q1) a) Explain fundamental properties of individual sedimentary particles. **[5]**

b) Discuss the nature of sediment problems. **[5]**

Q2) a) Write short note on Shields analysis. **[5]**

b) What are the significance and characteristics of dunes, antidunes? **[5]**

Q3) a) Explain the different empirical, dimensional and semi-theoretical bed load equations. **[7]**

b) What are the different Modes of sediment transport. **[3]**

Q4) a) What do you mean by bed load? Explain DuBoys equation giving basic assumptions made in it. **[5]**

b) Explain "Saltation mechanism". **[5]**

P.T.O.

- Q5)** a) Design an irrigation channel in alluvial soil according to Lacey's method for following data. [5]
- i) Full supply discharge: $75 \text{ m}^3/\text{sec}$
 - ii) Lacey's silt factor - 0.9
 - iii) Channel side slope 0.5 H : 1 V
- b) Explain Bunch and simmon-Albertston method for design of stable channel. [5]
-
- Q6)** a) Write a short note on. [5]
- i) Suspended load measurement,
 - ii) Continuity Equation for sediment
- b) Explain agradation and degradation. [5]
-
- Q7)** a) What are the objective of river training and bank protection. [5]
- b) Explain sediment control in case of river training works. [5]
-
- Q8)** a) Explain different river models with respect to its need & importance.[5]
- b) Discuss sediment transport through pipes. [5]



Total No. of Questions : 8]

SEAT No. :

P3885

[5155]-134

[Total No. of Pages :3

M.E. (Civil) (Hydraulics)
HYDROLOGY
(2013 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any 5 of the following questions.*
- 2) *Neat diagram should 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.*

Q1) a) Explain why hydrology becomes the base for development of a nation. What are components of hydrology and explain their importance in development of water resources of a country. **[5]**

b) What are the various losses of precipitation and draw an engineering representation of hydrologic cycle. **[5]**

Q2) a) What are the different infiltration equation? Explain how the parameters f_o, f_c , & k in the Horton equation are obtained from experimental data. **[5]**

b) What do you understand by Stochastic process and explain the necessity of using such process? Explain the hydrologic time series with example. **[5]**

Q3) a) Explain how Stochastic Processes is classified and explain. **[6]**

i) Stochastic Processes with Continuous Parameter and Discrete State Space.

ii) Stochastic Processes with Continuous Parameter and State Spaces.

b) What do you understand by synthetic unit hydrograph? Explain the Snyder method for the peak discharge of the unit-hydrograph. **[4]**

P.T.O.

Q4) a) With sketch of a unit hydrograph and discuss the various assumptions in deriving the same. Explain the convolution and deconvolution methods in determining the direct runoff. [5]

b) The following ordinates of 4hr unit hydrograph was obtained for a catchment. [5]

Time (hr)	0	4	8	12	16	20	24	28	32	36	40	44
ord	0	18	55	135	110	85	68	45	28	20	10	0

Derive the flood hydrograph for the catchment due to the storm as below.

Time from start of storm (hr)	0	4	8	12
Accumulated rainfall (cm)	0	4.5	5.0	8.5

Assume a base flow of 18 m³/s and Φ - index of 0.20 cm/h.

Q5) a) What is concentration time and how is it estimated? Describe the method of estimating T_r year flood using Gumbel distribution. [5]

b) Explain in detail the construction of extreme value probability paper. [5]

Q6) a) What are aquifers and explain aquiclude, aquifuge and aquitard. [5]

b) The following details are available for an water bearing strata that connects 2 aquifers. The current groundwater potential was builtup during 10,000 year of groundwater movement between 2 aquifers.

Distance between 2 aquifers= 40 km, Aquifer thickness= 35m, inclination of aquifer is 20m/km. Hydraulic gradient=0.55m/km. Find the transmissibility of the aquifer. [5]

Q7) a) Derive the Theim equation for confined aquifer and what are its limitation. **[4]**

b) A gravity well has a diameter of 50cm m. The depth of water in the well is 38 m before the pumping is started. When pumping is being done at the rate of 3.33×10^{-2} cumecs, the drawdown in a well 12 m away is 4.3 m and in another well 25 m away is 1.8 m. Determine: (1) Drawdown in the well (2) Co-efficient of permeability (3) The maximum rate of pumping the well. **[6]**

Q8) a) What are the different types of artificial recharge of groundwater and explain any one method. **[5]**

b) What are the main factors that produce a change in groundwater quality? Explain the water quality plots. **[5]**



Total No. of Questions : 7]

SEAT No. :

P3886

[5155]-135

[Total No. of Pages : 2

**M.E. (Civil) (Hydraulics)
DAM ENGINEERING
(2013 Course) (Semester - III)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary and state them clearly.*
- 4) *Use of electronic pocket calculator is allowed.*

Q1) A gravity dam is 10m high has a top width of 1m base width 9m and the front face is vertical. Assume unit weight of concrete = 24 kN/m³ and the water is stored up to the top of dam. Determine **[10]**

- a) FOS against overturning.
- b) Compressive and principle stress at toe & heel.
- c) Shear stress at toe & heel.

Q2) a) Explain methods of controlling temperature in mass concreting. **[5]**
b) Discuss Rollar compartmented concrete-concept, method of placing, advantages & disadvantages & case study. **[5]**

Q3) a) Explain with a neat sketch classification of arch dam. **[5]**
b) Derive the equation for thickness of rib of arch dam. **[5]**

Q4) a) State various types of instrument used in dam and its significance. **[5]**
b) Explain the types of Butlress dams. **[5]**

Q5) Determine the factor safety of D/S slope of an earthen dam of homogeneous section drawn to scale of 1: 500 with the following data **[10]**

- a) Length of slip circle = 15 cm
- b) Total area of N-rectangle = 16.5 cm²
- c) Total area of T-rectangle = 7 cm²

P.T.O.

- d) Total area of U-rectangle = 5cm^2
- e) Angle of internal friction = 26°
- f) Cohesion, $C = 0.2\text{ kg/cm}^2$
- g) Specific weight of soil = 1.8 kg/cm^2

Q6) An earthen dam made up of homogeneous section has the following data:

[10]

- a) Coefficient of permeability = $5 \times 10^{-4}\text{ cm/s}$
- b) R.L. of top of dam = 200m
- c) R.L. of deepest river bed = 178.00m
- d) H.F.L = 197.5m
- e) Width of dam at top = 4m
- f) U/S slope = 3:1
- g) D/S slope = 2:1

Draw seepage line if a horizontal filter of 25m length is provided inwards from D/S toe of dam.

Q7) Design the profile of ogee spillway of 125m length to carry discharge of 2500 cumecs. Take the level of bed of river as 500m and the level of water = 550m.

[10]



Total No. of Questions : 8]

SEAT No. :

P3887

[5155]-136

[Total No. of Pages :4

M.E. (Civil - Hydraulics)
OPTIMIZATION TECHNIQUES
(2013 Course) (End Semester) (Semester -III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any FIVE questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*
- 5) *Use of calculator is allowed.*

Q1) a) Minimize $Z = 3x_1 + 2x_2 + 4x_3$ [6]

S.t. $2x_1 + x_2 + x_3 = 60$

$$3x_1 + 3x_2 + 5x_3 \geq 120$$

$$x_1, x_2, x_3 \geq 0. \text{ Use two phase method only.}$$

b) Find the value of x in the interval $(0, 1)$ which minimizes the function $f = x(x - 1.5)$ to within ± 0.05 by [4]

- i) the golden section method and
- ii) the Fibonacci method.

Q2) a) Find the minimum of the function $f = \lambda^5 - 5\lambda^3 - 18\lambda + 5$ Golden section method in the interval $(0, 5)$. [5]

b) Carryout five iterations for the following problem using method of steepest descent. [5]

Assume that $X^0 = 0$.

$$\text{Min } f(X) = x_1 - x_2 + x_1^2 - x_1x_2$$

P.T.O.

- Q3) a)** Water is to be supplied to three irrigation areas in terms of number of full units of water to maximize benefits. The supply for the three irrigation areas are given in table below. Determine the optimal solution when water available is 6 units. [6]

Unit of water	Benefit of each irrigation area		
	Area 1	Area 2	Area 3
0	0	0	0
1	30	20	45
2	60	30	65
3	80	70	82
4	90	95	95
5	110	135	120

- b) Explain in detail with suitable example - canonical form of the LPP. [4]

- Q4) a)** Solve by the Big M method: [5]

$$\text{Maximize } Z = 2x_1 + 5x_2 - 3x_3$$

$$\text{S.t. } x_1 + x_2 + x_3 = 10$$

$$x_1 - x_2 \geq 1$$

$$2x_1 + 3x_2 + x_3 \leq 40$$

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

- b) Explain algorithm of Newton's method. What are its advantages over steepest gradient technique? [5]

- Q5) a)** Due high level in employment in Pune, mobility of population towards Pune in last decade increased tremendously. This mobility is from other parts of Maharashtra State. Following table shows mobility of population amongst Pune, Kolhapur and Nagpur in percentage. Assume population proportion is 70,00000, 20,00000 and 10,00000 respectively. [6]

	Pune	Kolhapur	Nagpur
Pune	50%	30%	20%
Kolhapur	10%	70%	20%
Nagpur	10%	40%	50%

Assume mobility period is 10 yrs. What will be population after 10yrs and 20 yrs.

- b) Explain Decision Tree in Decision Analysis. [4]

- Q6) a)** Solve the Game. [5]

	B ₁	B ₂
A ₁	28	0
A ₂	2	12
A ₃	4	7

- b) What is Simulation? Explain applications of simulations. [5]

- Q7) a)** Data have been accumulated at a banking facility regarding the waiting time for delivery of trucks at the loading deck is 2 per hour. The average time to load truck using 3 loaders is 20min. Find [6]

- i) Expected no. trucks in the system.
- ii) Expected no. trucks waiting to be served.
- iii) The expected time in waiting line.
- iv) The probability that the truck has to wait for service.
- v) The probability of no units in the system.

- b) Explain queuing theory with suitable example. [4]

- Q8) a)** Following is the distribution of defective pieces in a manufacturing process of a MNC in Pune. **[6]**

No. of Defective Items	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Consider the following sequence of random numbers

48, 78, 19, 51, 56, 77, 15, 14, 68, 09.

Using this sequence, simulate the number of defective items for next 10 days.

- b) Explain Zero sum game with an example. **[4]**

⊗ ⊗ ⊗

Total No. of Questions : 8]

SEAT No. :

P3888

[5155]-137

[Total No. of Pages : 2

**M.E. (Civil)(Structure Engineering)
ADVANCED MECHANICS OF SOLIDS
(2013 Course) (Semester - I) (Credit)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions from the following.*
- 2) *Neat diagram must be drawn wherever necessary*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary and clearly state.*
- 5) *Use of cell phone is prohibited in the examination hall.*
- 6) *Use of electronic pocket calculator is allowed.*

- Q1)** a) A plane passing through a point (x, y, z) in a stress elastic body has its normal n having direction cosines $\cos(n, x)$, $\cos(n, y)$ and $\cos(n, z)$. Obtain expression for the resultant stress and its direction in the form of six independent stress components at the point. **[6]**
- b) Obtain the strain-displacement relation for the six independent strain components in an elastic body. **[4]**
- Q2)** a) Define Airy's stress function ϕ when the body forces are absent. Prove that ϕ satisfies the governing equation $\nabla^4\phi = 0$. **[7]**
- b) Explain with suitable example plane stress and a plane strain problem of elasticity. **[3]**
- Q3)** a) Write the basic equation for a plane stress 2D problems in polar coordinates. **[3]**
- b) Obtain differential equation of equilibrium in polar coordinate. **[7]**
- Q4)** a) A thick wall cylindrical vessel has an inside diameter 300 mm and the outside diameter 400 mm. The vessel is subjected to an internal pressure of 40 MPa. Determine the variation of radial and circumferential stresses in the vessel. **[4]**
- b) Obtain stress components when concentrated load acting on the vertex of a wedge (Michell's problem) **[6]**

P.T.O.

- Q5)** a) A quarter circle beam of radius 2 m curved in plan is fixed at A and free at B. It carries vertical downward load $P = 50$ kN at free end B, determine the deflection at free end B. [5]
- b) Determine the reactions at supports for a semicircular beam ABC loaded with uniformly distributed load w kN/m over entire span. The beam is simply supported at end A & C and continuous over support B. [5]
- Q6)** a) Differentiate between beam curve in plan and elevation. [3]
- b) Show that the neutral axis of curve beam in elevation is below the centroidal axis towards the center of curvature.. [7]
- Q7)** a) Explain St. Venant's theory of torsion for prismatic bars of non circular cross section. [5]
- b) Explain membrane analogy for thin walled structures. [5]
- Q8)** a) Explain Winklers foundations and obtain differential equation for beams on elastic foundation. [6]
- b) Explain the following: [4]
- i) Infinite beam
 - ii) Semi-infinite beam
 - iii) Finite beam
 - iv) Foundation modulus

x x x

Total No. of Questions : 8]

SEAT No. :

P3889

[5155]-138

[Total No. of Pages : 2

M.E. (Civil-Structures)
STRUCTURAL DYNAMICS
(2013 Course) (Semester - I) (End Semester)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.
- 2) Figures to the right indicate full marks.
- 3) If necessary, assume suitable data and indicate clearly.
- 4) Use of electronic pocket calculator is allowed.

Q1) Explain with suitable examples the various forms of damping and their effects on the response of structures. [10]

Q2) Explain convolution integral with an example. [10]

Q3) A 750 kg machine is mounted on a platform and is subjected to an excitation force F as shown in Fig. 1. The combined stiffness of the columns supporting the platform is k . Determine the amplitude of the motion and the force transmitted to the foundation when $k = 2 \times 10^6$ N/m. [10]

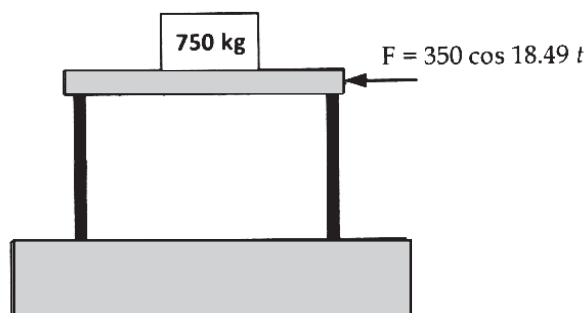


Fig. 1

Q4) Explain linear acceleration method. [10]

P.T.O.

Q5) Determine the natural frequencies and mode shapes for the system shown in Fig.2. Consider $m_1 = 9 \text{ kg}$; $m_2 = 1 \text{ kg}$; $k_1 = 24 \text{ N/m}$; $k_2 = 3 \text{ N/m}$; $k_3 = 3 \text{ N/m}$ and $c_1 = c_2 = c_3 = 0$. [10]

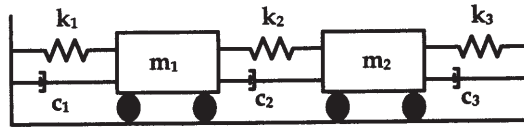


Fig. 2

Q6) Determine the natural frequencies of the system shown in Fig. 3 by the Stodola method. Consider $m_1 = m_2 = m_3 = m$ and $k_1 = k_2 = k_3 = k$. [10]

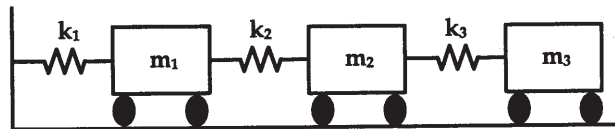


Fig. 3

Q7) Explain step-by-step procedure of Wilson- θ method. [10]

Q8) The assumed modes for the uniform beam shown in Fig. 4 are $\frac{x}{l}$ and

$\sin\left(\frac{\pi x}{l}\right)$. Determine the two natural frequencies and modes shapes using the Rayleigh-Ritz method. [10]

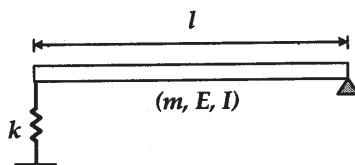


Fig. 4

X X X

Total No. of Questions : 8]

SEAT No :

P 3890

[5155]-139

[Total No. of Pages :3

M.E. (Civil - Structures)

ADVANCED DESIGN OF STEEL STRUCTURES (ADSS)

(2013 Course) (Semester-I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five from eight questions.*
- 2) Figures to the right indicates full marks.*
- 3) Use IS - IS: 800-2007, IS: 800-1984, IS: 801, IS: 802, IS: 811, SP-34 and Nonprogrammable calculator.*
- 4) Neat diagrams must be drawn wherever necessary.*
- 5) More reproduction from IS code as answer, will not be given full marks.*
- 6) Assume suitable data, if necessary.*

Q1) a) Explain which are different loads are coming on Hoarding Structures. **[3]**

- b) The design factored forces coming in member of a hording structure are 200 KN tensile force, and 100 kN compressive force. Design a channel section back to back on opposite faces of 8 mm thick gusset plate with M20 black bolt of 4.6 grade of steel. Take length of member as 3m c/c. Draw the design sketch. **[7]**

Q2) a) List out the various assumptions made while designing castellated beams. **[3]**

- b) Design a castellated beam in grade Fe410 steel to carry an imposed load of 4.5kN/m and dead load of 3kN/m over a simply supported span of 12m. Assume that the compression flange is fully restrained. **[7]**

P.T.O.

- Q3) a)** List out the various forces acting on microwave towers. [3]
- b)** A 40m high microwave antenna lattice tower is to be built near pune the terrain at the site is nearly a level ground with terrain of category 1. The diameter of the hemispherical antenna disc, fixed at the top is 3m. The width of the tower at the top is 3m. Select a suitable configuration for the tower and determine maximum compressive fore and tension in the tower legs and also the maximum shear at the base, for the following data. [7]
- Weight of antenna disc and fixtures: .5kN
 Weight of paltform at the top: 1.0kN/m²
 Weight of railing at top: 0.5kN/m²
 Weight of ladder and the cage: 0.75kN/m
 Weight of miscellaneous item: 2.5kN

Q4) A steel tower is to be erected for transmission line of a single circuit 3-phase 50cycles/sec, to transmit 40MWat 0.85 power factor for 200 km. Assuming Suitable data determine the maximum sag of the conductor at mid span. [10]

- Q5) a)** Write a short note on. [4]
- i) List out the advantages of tabular members.
 ii) Types of connections used in round tubes.
- b)** A tabular column hinged at one and roller support at other end has the outside diameter of the tube 150mm and is of heavy gauge (i.e @ 16.2 kg/m). The length of the column is 3.0m. Determine the safe load the column can carry if the column is of IS 1161 grade Yst 240 steel. [6]

- Q6) a)** What are the advantages and disadvantages of light-gauge sections and draw different forms of it. [3]
- b)** Find the column section properties and allowable load for the column section shown in Figure 1. The effective length of column is 3.0m. Take $f_y=235$ MPa. [7]

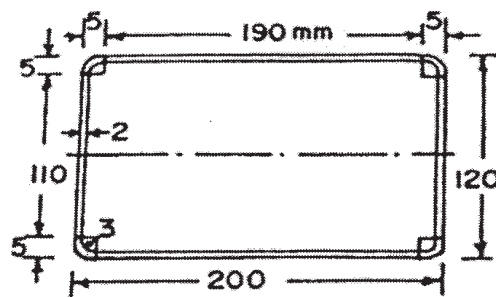


Figure 1

Q7) Design a self supporting lined chimney to the following particulars **[10]**

Height of the chimney = 70m.

Diameter of the chimney = 3.5m

Thickness of the lining = 120mm

Wind Pressure = 1250N/mm^2 on flat vertical surface.

Take safe tensile stress = 135 N/mm^2 .

The foundation has to rest on medium soil having bearing capacity = 230 kN/m^2

Q8) A column section ISHB350@ 907.4 N/m is subjected to following factored loads. **[10]**

Axial compressive load, $P = 450\text{ kN}$

Moment, $M = 85\text{ kN.m}$

Assuming M25 grade of concrete for the pedestal and a square base plate, design the following

i) Thickness of base plate

ii) Anchor bolts.



Total No. of Questions : 8]

SEAT No. :

P3891

[5155]- 140

[Total No. of Pages : 2

M.E. (Civil) (Structural Engineering)
RESEARCH METHODOLOGY TREATMENT
(2013 Pattern) (Semester - I)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Solve any Five questions.*
- 2) *Figures to the right indicate full marks.*

- Q1)** a) Enlist various types of Research and discuss any one type of Research which is relevant to Civil Engineering with example. [5]
- b) Define case study research method in CIVIL ENGINEERING and give two examples. [5]
- Q2)** a) “Research provides the basis for nearly all government policies in our economics system. Explain. [5]
- b) List components of research paper to be published in journal. [5]
- Q3)** a) Write a note on “Primary and secondary methods of Literature survey”. [5]
- b) Explain the characteristics of a good sample design. [5]
- Q4)** a) Explain the various sources of error in measurement. [5]
- b) Enumerate the different methods of collecting data. Explain its merits and demerits. [5]
- Q5)** a) Explain the significance of the analysis of variance. [5]
- b) Write a note on “Two tailed and one tailed tests”. [5]

P.T.O.

- Q6)** a) Write a note on ‘cluster analysis’. [5]
b) Enlist Important Parametric tests for Hypothesis testing and explain.[5]
- Q7)** a) Explain the steps for patenting a research idea. [5]
b) Write a note on “Importance of publishing research papers”. [5]
- Q8)** Write a research proposal for a suitable research problem (any problem related to Civil engineering can be considered) to a funding agency with reference to the following terms:
Title, Introduction, origin of the problem, expected outcome, literature review, Significance of the study in the context of current status, objectives, methodology, year wise plan. [10]



Total No. of Questions : 8]

SEAT No. :

P3892

[5155]- 141

[Total No. of Pages : 2

M.E. (Civil - Structural Engineering)
FINITE ELEMENT ANALYSIS
(2013 Pattern) (Semester - II)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 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.*

Q1) a) The potential energy of a simply supported beam of length '1' loaded by

a central concentrated force P is $\Pi = \int_0^1 \frac{1}{2} EI \left(\frac{d^2 v}{dx^2} \right)^2 dx - Pv$, where EI is

the modulus of flexural rigidity, 'v' is transverse deflection of the beam. Assuming the deflection function as $v = A \sin (\pi x/1)$, find the maximum deflection using Ritz method. Assume EI to be constant. **[4]**

b) Derive elemental stiffness matrix for a beam element using variational approach. **[6]**

Q2) a) Differentiate between

i) CST and LST elements.

ii) Grid refinement and use of higher order element. **[4]**

b) Write in detail the convergence requirements for a displacement function. Explain each requirement with suitable example. **[6]**

Q3) A beam fixed at its ends carries a central point load P. There is an elastic spring support under the load having stiffness $76EI/L^3$. Analyse the beam using direct approach of FEM. **[10]**

P.T.O.

- Q4)** a) For constant strain triangular element, derive shape functions using area coordinates and derive the strain displacement matrix[B]. [5]
- b) Derive all the shape functions of an eight noded brick element of unit length. Consider the origin (0,0,0) at node 1. [5]
- Q5)** Write the expressions for normal and shear strain for the axisymmetric element and give the elasticity matrix [D] matrix for the axisymmetric element Derive from the first principles (Assuming displacement function) the stiffness matrix for a typical triangular axisymmetric element. [10]
- Q6)** A quadrilateral element has coordinates: A (0, 0), B (10, 0), C (10, 15), D (0,10). Transform this element into a square element in natural coordinates. Find out the Jacobian and its determinant. [10]
- Q7)** Write in detail about Mindlin's plate element. [10]
- Q8)** Write about the finite element formulation using four noded degenerated quadrilateral shell element. [10]



Total No. of Questions : 8]

SEAT No :

P 3893

[5155]-142

[Total No. of Pages :2

M.E. (Civil - Structures)
THEORY OF PLATES AND SHELLS
(2013 Credit Course) (Semester-II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer ant five questions from the following.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicates full marks.*
- 4) Assume suitable data, if necessary and clearly state.*
- 5) Use of cell phone is prohibited in the examination hall.*
- 6) Use of electronic pocket calculator is allowed.*

Q1) a) Differentiate small and large deflections of thin plate. Explain the assumption of small deflection theory of thin plates. **[5]**

b) Derive an appropriate expression for pure bending of plates. **[5]**

Q2) a) Explain boundary condition for the analysis of plates. **[3]**

b) A rectangular plate of size $a \times b$ with four edges simply supported carries a uniformly distributed load q . Derive an expression for moments using Navier's method. **[7]**

Q3) a) Derive an expression for maximum deflection of the rectangular plate with simply supported edges subjected to moments M distributed along the edge at $y = \pm b/2$ by Lavy's method. **[8]**

b) Explain in brief moment curvature relationship for first order shear deformation theory. **[2]**

Q4) a) Develop moment curvature relations for a circular plate. **[5]**

b) Describe the boundary condition for the circular plate and a circular plate with central hole. **[5]**

P.T.O.

- Q5)** a) State and explain in brief classification of shell with sketches. [4]
b) Differentiate cylindrical, conical and spherical shells on the basis of analysis. [6]
- Q6)** a) Explain application of membrane theory for the analysis of Circular cylindrical shells. [5]
b) Derive equilibrium equations for circular cylindrical shells using membrane theory. [5]
- Q7)** a) Derive governing differential equation for circular cylindrical shells using bending theory. [5]
b) Analyze pipes and pressure vessels using bending theory. [5]
- Q8)** a) Explain in brief principle of Lundgren's beam theory and its application for the analysis of cylindrical shell. [5]
b) Differentiate beam analysis and arch analysis using beam theory. [5]



Total No. of Questions : 8]

SEAT No. :

P3987

[Total No. of Pages : 2

[5155]-143
M.E. (Civil Structure)
ADVANCED DESIGN OF CONCRETE STRUCTURES
(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidate:

- 1) *Attempt any five questions from the following.*
- 2) *Draw neat diagrams.*
- 3) *Figures to the right indicates full marks.*
- 4) *Assume suitable data if necessary.*
- 5) *Use of cell phone is prohibited.*
- 6) *Use of electronics pocket calculator, is 456 is allowed.*

Q1) a) Draw yield lines for the following. **[6]**

- i) Right angled triangular slab, fixed at two sides making right angle, unsupported at third side.
- ii) Rectangular slab with three edges fixed and one long edge unsupported.

b) Write short note with sketches on Characteristics of yield lines. **[4]**

Q2) A rectangular slab is simply supported at the ends. Design the slab to carry superimposed load of 5kN/m^2 , if the slab is to be orthogonally reinforced. Use M20 and Fe 500. Use yield line theory. **[10]**

Q3) Design a grid slab for a floor of hall $14\text{m} \times 16\text{m}$ having square grid of 2m. Use M25 and Fe415. **[10]**

Q4) Design an interior panel of flat slab $5\text{m} \times 6\text{m}$ for a live load of 5kN/m^2 and FF 1kN/m^2 . Use M20 and Fe 415. **[10]**

P.T.O

Q5) Design a container for circular type ESR for 1 lakh liters with straight height 12m using M25, Fe 415 in earthquake zone III. SBC is 200kN/m². Design of staging is not required. **[10]**

Q6) Design a square bunker to store 110 tonnes of cement for the following. Density of 10 cement is 32kN/m². Angle of repose is 29°. use M25 Fe 415. Draw details of reinforcement. **[10]**

Q7) Design raft foundation for the following center to center distance of column in both directions is 2.4m, column size 300×300mm, working axial load on each column is 600kN. The depth of the strata is 1.8m. Use M20 and Fe 415. SBC 100kN/m². Draw reinforcement details. **[10]**

Q8) a) Write detailed note on design of formwork for flat slab. **[10]**
b) Write detailed note on Bar bell shear wall.



Total No. of Questions : 8]

SEAT No. :

P3894

[5155]-144

[Total No. of Pages :1

M.E. (Civil) (Structure)

**EARTHQUAKE ENGINEERING & DISASTER MANAGEMENT
(2013 Course) (Semester-III) (End Semester) (601013)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.*
- 2) Figures to the right indicate full marks.*
- 3) If necessary, assume suitable data and indicate clearly.*
- 4) Use of electronic pocket calculator is allowed.*

- Q1)** Explain any three types of man-made disasters. **[10]**
- Q2)** Write a note on pre-disaster activities. Explain any one activity in detail. **[10]**
- Q3)** What is response spectrum? When is it used for the analysis? **[10]**
- Q4)** Explain capacity based design. **[10]**
- Q5)** A restrained beam of span 5m carries a total uniformly distributed load of 55 kN/m. The moment due to lateral loads is 80 kN-m. the shear force is 60 kN. Design the beam and sketch the detail as per IS : 13920. **[10]**
- Q6)** What are the functions of shear walls? Explain the different types with neat sketches. **[10]**
- Q7)** What parameters need to be considered while doing fire analysis of steel structures. **[10]**
- Q8)** Explain the models of failure of masonry structures. Explain two repair techniques. **[10]**



Total No. of Questions : 8]

SEAT No. :

P3895

[5155]-145

[Total No. of Pages : 2

M.E. (Civil) (Structures)
STRUCTURAL DESIGN OF CONCRETE AND
PRESTRESSED BRIDGES
(2013 Course) (Semester - III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *All answers should be written in same book.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of IRC- 5,6,18,27,45,78 & 83 codes, IS 1343, IS 456-2000 is allowed.*
- 5) *Mere reproduction of theory from IS or IRC codes as answer will not get full credit.*
- 6) *Neat diagrams must be drawn wherever necessary.*
- 7) *Assume any other data, if necessary.*

Q1) a) Write short note on structural forms of bridge decks. **[5]**

b) What are the factors affecting the span of bridge. **[5]**

Q2) a) Write short note IRC 70R loading. **[5]**

b) Explain loading standards for railway bridges. **[5]**

Q3) Design only slab the slab culvert with the data: **[10]**

Clear span of the culvert = 5 m

Clear carriage way width = 7.5m

Size of kerb = 200mm x 600 mm

Average thickness of wearing coat 80 mm

Use material M30, Fe 500

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.

Q4) Design the deck slab only and calculate the maximum bending moment and shear force intermediate post tensioned prestressed concrete bridge girder for the following. Effective span=16m, width of carriageway=7.5m, No. of beams 4, equally spaced along the carriageway width, Spacing of cross girders=4m cle, width of footpath on either side of carriageway=1.2m loading class=IRC class AA, kerb size=200 X 600mm, Material M25 & TMT for deck slab. **[10]**

Q5) a) Differentiate between rigid frame bridges and simply supported bridges. **[5]**

b) Explain with sketches, how rigid frame bridges are classified **[5]**

Q6) Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data. **[10]**

Maximum vertical load = 400 kN

Dynamic vertical load = 40 kN

Transverse lateral load = 50 kN

Longitudinal load = 50 kN

Longitudinal total translation 10 mm

Rotation at support 0.003°

Shear modulus of elastomeric bearing = 1.2 N/mm²

Allowable comp. stress for concrete = 8 N/mm²

Allowable comp. stress for elastomer = 10 N/mm²

Q7) a) Explain the forces acting on wing wall for bridges. **[5]**

b) Explain with sketches, the types wing walls. **[5]**

Q8) Design open well type foundation for a pier in sandy soil for following: **[10]**

Diameter of pier at bottom=2m

Height of bearing above the maximum scour level= 25m

Permissible horizontal displacement at bearing level = 10mm

Total vertical load including self-weight of pier= 8000kN

Total lateral force at scour level= 130kN

Submerged unit weight of soil= 10 kN/m³

Material of pier and footing= M30 & Fe500

Design the RCC well and check the stresses at the staining.

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Total No. of Questions : 8]

SEAT No. :

P3896

[5155]-146

[Total No. of Pages : 2

M.E. (Civil)

WATER RESOURCES AND ENVIRONMENTAL ENGINEERING

Planning and Management of Water Resources

(2013 Course) (Semster - I) (501081)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions from all the questions.*
- 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.*

Q1) a) What are various opportunities created by water resource? Justify need of planning and management of water resources. **[6]**

b) Explain the system components of water resources planning and management and state various approaches of planning and management of water resources. **[4]**

Q2) a) Comment on constraints for development of water resources. **[5]**

b) Explain constraints like non reversibility for development of water resources. **[5]**

Q3) a) Explain financial analysis of multipurpose water resources projects. **[6]**

b) Comment on repayment of cost in multipurpose project. **[4]**

Q4) a) How the priority is fixed as per Maharashtra water act for various purposes. **[6]**

b) What are various plans implanted for controlling flood. **[4]**

Q5) a) How reservoir sedimentation control is playing important role in water management. **[4]**

b) Explain any one water doctrine to avoid conflict amongst users. **[6]**

P.T.O.

- Q6)** a) How is the impact of climate change on river flow regimes related to the impact on mean annual runoff. [4]
b) Explain vulnerability assessment of water supply in agricultural reservoir utilizing probability distribution and reliability analysis methods. [6]
- Q7)** a) Write a note on center for ground water evaluation and management. [4]
b) Explain how conjunctive use of surface and ground water play Important role in water management. [6]
- Q8)** a) State discounting techniques and explain any one. [4]
b) Explain social benefits due to water resources projects. [6]

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Total No. of Questions : 8]

SEAT No. :

P3897

[5155]- 147

[Total No. of Pages : 2

M.E. (WREE)

ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY

(2013 Pattern) (Semester - I) (501082)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any Five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data wherever necessary.*
- 4) *Use of electronic pocket calculator is allowed.*

Q1) A 50 m stack height is used for boiler which consume 1000 kg of coal/hr is having 0.8% of sulphur. Calculate average ground level concentration in microgram per gram under following meteorological conditions. **[10]**

Stability					Wind speed
ClassB	1Km	4Km	1Km	4Km	-
	141	500	120	510	4m/sec.

Also, determine plume height by using Holland's equation temp. of ambient air is 20°C, temp. of stack gas is 200°C, velocity of stack gas 10m/sec, Atmospheric pressure 1000 m Bar.

Q2) Determine solvent requirement for adsorption tower to remove sulphur dioxide gas having discharge 20 cm/sec at 1 atmospheric pressure and 20°C. sulphur dioxide content 8% by volume. If system in design for 91% removal than equilibrium line of sulpherdioxide & water is $x=y/40$. Also plot equilibrium line for different values of x & y. **[10]**

Q3) a) A 0.20 kg of air at pressure of 140 KN/m² occupies 0.12 cum volume after this conditions air is compressed to 1400 KN/m². Air behave $pV^{1.2} = \text{constant}$. Determine w.D., change in internal energy and entropy. **[6]**

b) Explain basic principle of AAS, its applications. **[4]**

P.T.O.

- Q4)** a) Determine diameter of cyclone chamber for the following data; viscosity at 20°C = 1.2×10^{-5} kg/m⁻⁹, density of particle = 1200kg/m³, density of gas = 1Kg/m³; n=10; w=1m, L=4m, Discharge = 6m³/sec. [6]
- b) Explain different methods for removal of TDS. [4]

- Q5)** Find capacity of anaerobic digester; from following data; [10]
MCRT = 10 day; 8s = 600mg/lit; ss removed in PST = 60%, sp. gravity of sludge = 1.04; concentration of solids in sludge ps = 0.06; Density of water = 1000 Kg/m³.
Find-
- a) Sludge produced due to S.S.removed.
b) Volume of primary sludge.
c) Volume of digester.

- Q6)** Explain basic principle of Trickling filter, draw neat sketch and its applications with design parameter. [10]

- Q7)** Explain the electro dialysis process and determine power required for electro dialysis process for the following data; [10]
Q = 4000 m³/day; TDS = 2000 mg/lit; No.of cells = 300 catians and anions concentration = 0.011 Eq/L; salt removed efficiency = 50%; current efficiency = 90%; R = 50 ohm use data sheet if required.

- Q8)** Write basic principle diagram & application with design parameters of the following;
- a) Common efficient Treatment plant. [5]
b) Activated sludge process (ASP) [5]



Total No. of Questions : 8]

SEAT No :

P 3898

[5155]-148

[Total No. of Pages :2

M.E. (Civil) (Water Resources and Environmental Engg.)

FLUID MECHANICS

(2013 Course) (Semester-I) (501083)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicates full marks.*
- 4) *Use of logarithms tables, slide rule, electronics pocket calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) The velocity potential function for a two-dimensional flow is $\Phi = x(3y-1)$ at a point P(3,5) determine: the velocity, the value of stream function. **[6]**

b) Define nominal thickness, momentum thickness, energy thickness and laminar sub-layer of a boundary layer. **[4]**

Q2) a) Derive Bernoulli's equation along a streamline. **[4]**

b) For the following velocity profiles in the boundary layer on a flat plate, calculate the displacement thickness in terms of the nominal boundary layer thickness δ . a) $u/U = n$ b) $u/U = 2n - n^2$ Where $n = y/\delta$ **[6]**

Q3) a) Derive differential form of continuity equation in cylindrical polar coordinate system. **[5]**

b) A circular pipe of 25mm diameter and 2m long carried an oil of sp. gr. 0.9 and viscosity 0.15 N-s/m² at 1/10 of critical velocity for which Reynold's number is 2450. Find: a) Velocity of through pipe b) head in meters of oil to maintain flow. **[5]**

P.T.O.

- Q4)** a) Derive equation for stream function and velocity potential for a doublet. [5]
b) Derive equation for velocity distribution for flow between parallel plates with one plate moving and the other at rest starting with Navier-Stokes equations. [5]
- Q5)** a) Derive Karman Integral momentum equation. [5]
b) Derive Reynolds equation of motion. [5]
- Q6)** a) Derive equation for boundary layer over a flat plate starting with boundary layer equations. [6]
b) What are the factors affecting the transition from laminar to turbulent flow. [4]
- Q7)** a) Derive equation for stagnation density. [5]
b) Discuss the analogy between the normal shock wave and the hydraulic jump. [5]
- Q8)** a) Derive equation for work done in adiabatic process. [5]
b) What is the effect of compressibility on drag. [5]



Total No. of Questions : 8]

SEAT No. :

P3899

[5155]- 149

[Total No. of Pages : 2

M.E. (Civil) (Water Resource & Environmental Engineering)
RESEARCH METHODOLOGY TREATMENT
(2013 Pattern) (Semester - I)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Solve any Five questions.*
- 2) *Figures to the right indicates full marks.*

- Q1)** a) Explain the factors to be considered while selection of Questionnaire method of data collection. **[5]**
- b) Enlist at least 4 different research funding agencies. Explain details about any one. **[5]**
- Q2)** a) Explain the characteristics of a research report? **[5]**
- b) What are the objectives of research. **[5]**
- Q3)** a) Explain the purpose of a literature review. **[5]**
- b) Explain the Graphic rating scale and Itemized rating scale techniques. **[5]**
- Q4)** a) Write the advantages and disadvantages of Internet as a sources of Literature review. **[5]**
- b) Explain the advantages and Limitations of Likert-type Scale. **[5]**
- Q5)** a) Write a short note on one-tailed and two tailed test. **[5]**
- b) Explain the procedure for hypothesis testing. **[5]**

P.T.O.

- Q6)** a) Explain the centroid method of factor analysis. [5]
b) Explain the conditions for the application of Chi-Square test. [5]
- Q7)** a) Explain different steps in writing report. [5]
b) Explain the factors to be considered for effective presenting a research.[5]
- Q8)** Write a research proposal for a suitable research problem (any problem related to Civil engineering can be considered) to a funding agency with reference to the following terms:
Title, Introduction, origin of the problem, expected outcome, literature review, Significance of the study in the context of current status, objectives, methodology, year wise plan. [10]



Total No. of Questions : 8]

SEAT No. :

P3900

[5155]- 150

[Total No. of Pages : 2

M.E. (Civil/WREE)

**ENVIRONMENTAL HYDRAULICS & ENVIRONMENTAL
STRUCTURES**

(2013 Pattern) (Semester - II) (501086)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt any 5 questions.*
- 2) *Assume suitable data wherever necessary.*
- 3) *Use of non - programable calculator is allowed.*

- Q1)** a) Explain the working of internal gear pump with figure. **[5]**
b) Determine the power of pump & optimum head if efficiency of pump is 80%. The pump is running at 800 rpm giving the following relationship.

Q(Discharge) in m ³ /min	Head in meter
0	23.5
4.5	20.1
8	19.0
13	17
18	14
22.8	0

The head of system is $H_m = 16 + 9.98 \times 10^{-3} Q^2$ in meter. **[5]**

- Q2)** a) A centrifugal compressor having inside diameter of 40mm & outside diameter of 80 mm & width of blade is 30 mm. Temperature of air at inlet is 30°C, inlet and outlet angle of blade are 8° and 20°. Temperature in the pipe is 40°C and pressure ratio is 2. Determine power required to drive compressor. **[5]**
b) Draw hydraulic circuit which contains 2 part actuator, 4/2 valve, PRN, pressure gauge, pump, motor, tank, for oil. **[5]**
- Q3)** a) Explain working of strain guage with figure. **[5]**
b) What are different type of liquid level measurement technique use. **[5]**

P.T.O.

- Q4)** a) Explain working of distillation column with figure. [5]
 b) Explain working of RID with figure and applications. [5]
- Q5)** a) A four story RC frame building with each story having height of 3.0 meter. Total load on each floor are 3000 kN on first floor, 3000kN on second floor, 2500 kN on third floor and roof load is 20,000 kN respectively. The soil below foundation is assumed to hard rock. Find out the total base shear force as per IS Code - 1983 (Part - I) - 2002.[6]
 b) Four spring are connected in parallel position and series position having stiffness as 2 N/M if weight of 1kg is attached in both position find natural frequency of system. [4]
- Q6)** a) An air receiver consist of a cylindrical portion of 4 meter length and 1.2 meter diameter. It is closed by hemispherical ends. The pressure is not exceed 3 MPa. If the material is steel having yield point 300 MPa and if factor of safety is 2.5 is used, calculate the required wall thickness of cylinder and thickness of hemispherical end. Assume joint efficiency as 0.9 for the shell and 0.8 for the end. Also determine storage capacity of the vessel. [8]
 b) Write formula for thickness of vessel on basis of maximum principle stress theory. [2]
- Q7)** A closed vessel is to be design to with stand an internal pressure of 50MPa having inside diameter of 500mm. Following properties may be assumed. Yield strength =300 MPa, ultimate tensile strength = 700 MPa, Position ratio = 0.5, FOS is 2. Estimate wall thickness on the basis of: [10]
 i) Maximum principal stress theory.
 ii) Maximum shear stress theory.
 iii) Maximum principal strain theory
 iv) Distortion energy theory.
- Q8)** Determine the thickness of well and steel required for water tank by working stress method having capacity of 1000 cum. meter, if height of tank is 4 meter. Use M30 concrete and Fe 250 steel. [10]



Total No. of Questions : 8]

SEAT No :

P 3901

[5155]-151

[Total No. of Pages :2

M.E. (Civil)

WATER RESOURCES AND ENVIRONMENTAL ENGG.

Hydrology

(2013 Course) (Semester-II) (501087)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer ant FIVE questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculators is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) Explain various methods to control reservoir evaporation. **[8]**

b) Explain Horton's infiltration curve and state the equation for infiltration capacity. **[2]**

Q2) a) Draw a flow chart for mathematical methods in hydrology and explain stochastic hydrology applications. **[7]**

b) Explain normal distribution (statistical). **[3]**

Q3) a) What is design flood? How it is calculated for various hydraulic structures. **[4]**

b) Explain log-normal distribution method. **[6]**

Q4) a) How inflow and outflow relation is useful to determine reservoir surplus water and capacity of reservoir. **[4]**

b) Explain in short Gumbel's method. **[6]**

P.T.O.

- Q5)** a) Explain step by step design of tube well. [5]
b) Design a tubewell to be sunk in confined aquifer of 20 m thickness fully. The yield required is 2400 m³/day. Coefficient of permeability of aquifer was found to be 40 m/day. The drawdown in the well was taken to be 4 m. [5]
- Q6)** a) What affects the quality of ground water in India. [6]
b) Explain cavity type and slotted type tube well. [4]
- Q7)** a) Explain importance of ground water recharge in the present scenario. [4]
b) State various methods to conserve ground water and explain any two. [6]
- Q8)** a) Explain sand tank model and transparent model for ground water modeling. [6]
b) Explain electric analog model for ground water modeling. [4]



Total No. of Questions : 8]

SEAT No. :

P3902

[5155]- 152

[Total No. of Pages : 2

M.E. (Civil) (Water resources and Environmental Engg.)

OPEN CHANNEL HYDRAULICS

(2013 Pattern) (Semester - II) (501088)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any Five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide rule and electronic pocket calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Define depth of flow, depth of flow section, Hydraulic radius, Hydraulic mean depth. **[4]**

b) A rectangular channel with bed width of 10 m, bed slope of 1 in 2500 and Manning's $n = 0.002$ carries a discharge of $10 \text{ m}^3/\text{s}$. Find the slope of water surface with respect to horizontal at the section where the depth of flow is 0.72 m. **[6]**

Q2) a) Design an economical channel with side slopes 2 H : 1 V, bed slope 1 : 3600 to carry discharge of $5 \text{ m}^3/\text{s}$. Take Manning's $n = 0.02$ **[6]**

b) Draw the water surface profiles when (i) a steep slope follows a steeper slope (ii) mild slope follows a steep slope **[4]**

Q3) a) Write in detail about hydraulic jump in rectangular channel with abrupt expansion. **[5]**

b) Write in detail about V. T. Chow's method to determine length of a water surface profile created by gradually varied flow. **[5]**

P.T.O.

- Q4)** a) How to determine energy loss in hydraulic jump graphically? [4]
 b) A Wide rectangular channel carries a discharge of $5 \text{ m}^3/\text{s}/\text{m}$. The bed slope of the channel is 1 in 3600 and Manning's $n = 0.02$. If the channel ends in a drop determine how far upstream the depth of flow would be 10% of the normal depth. Use step method. Take 2 steps. [6]
- Q5)** a) Derive equation for increasing discharge of spatially varied flow [4]
 b) Derive equation for celerity in case of a solitary wave. [6]
- Q6)** a) Derive relation for change in the area at a uniformly discharging side weir. How these weirs can be constructed? [6]
 b) Derive continuity equation of gradually varied unsteady flow. [4]
- Q7)** a) Design a regime channel for a discharge of 50 cumecs and silt factor 1.1 using Lacy's theory. [6]
 b) Write short note on finite difference approximation for flood routing. [4]
- Q8)** a) Define bed load, saltation load, suspended load, total load. [4]
 b) Route the following flood through a reach of $K = 22 \text{ h}$ and $x = 0.25$. At $t = 0$ the outflow discharge is $40 \text{ m}^3/\text{s}$. [6]

Time (h)	0	12	24	36	48	60	72	84	96	108	120	132	144
Inflow m^3/s	40	65	165	250	240	205	170	130	115	85	70	60	54



Total No. of Questions : 8]

SEAT No. :

P3903

[5155]-153

[Total No. of Pages : 2

**M.E. (Civil) (Water Resources & Environmental Engg.)
ADVANCED WATER & WASTE WATER TREATMENT
(2013 Course) (Semester - III)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

Q1) Explain in detail the principle and working of electro dialysis and ion exchange for water and waste water treatment. **[10]**

Q2) Discuss the principle, concept and necessity of aeration. Explain various method of aeration with neat sketches. **[10]**

Q3) What is the theory of disinfection? State the factors affecting disinfection. Explain break point chlorination. **[10]**

Q4) Design an aerated grit chamber for the treatment of municipal wastewater. The average flow rate is 0.5 m³/s. Take peak factor as 2.75. **[10]**

Q5) Design an activated sludge process for municipal wastewater flow rate of 8000 m³/day, BOD of settled effluent = 180 mg/l, excepted BOD of treated effluent = 10 mg/l, yield coefficient = 0.5 kg/kg, $K_d = 0.05/\text{day}$, MLSS = 3000 mg/l, return sludge solids concentration = 10,000 mg/l, and mean cell residence time is 10 days. Determine **[10]**

- a) Volume of reactor
- b) F/M ratio
- c) VLR
- d) Oxygen requirement
- e) Recycle ratio
- f) BOD removal efficiency

P.T.O.

- Q6)** Design a high rate trickling filter using NRC equations for **[10]**
- a) Sewage flow = 5MLD
 - b) Recirculation ratio = 1.5
 - c) BOD of raw sewage = 300 mg/l
 - d) BOB removal in PST = 35%
 - e) Final effluent BOD desired = 30 MG/L.

Q7) State the design parameters, principle, advantages and disadvantages of UASBR. Draw a neat sketch of the reactor. **[10]**

Q8) State the sources of waste water from manufacturing process, characteristics of effluent for dairy and automobile industry. Draw the treatment flow charts. **[10]**



Total No. of Questions : 8]

SEAT No. :

P3904

[5155]-154

[Total No. of Pages : 2

M.E. (Civil)

Water Resources And Environmental Engineering

DAM ENGINEERING

(2013 Course) (601093) (Semester - III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any FIVE questions.*
- 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.*

Q1) a) Enumerate various forces acting on a gravity dam. Explain your answer with typical sketch of gravity dam. **[4]**

b) Explain analysis for safety of gravity dams in detail. **[6]**

Q2) a) Explain step by step procedure for design of earthen dam. **[6]**

b) Discuss maintenance of earthen dam. **[4]**

Q3) a) Explain any one theory for design of arch dam. **[7]**

b) State advantages of arch dam over other types of dam. **[3]**

Q4) a) Explain various types of rock fill dams and draw the sketch of one of them. **[6]**

b) What is buttress dam? Explain the classification of buttress dam. **[4]**

P.T.O.

Q5) a) Explain straight drop spillway and ogee spillway. **[6]**

b) A saddle siphon has the following data **[4]**

Full reservoir level	435 m
Level of centre siphon outlet	429.6 m
High flood level	435.85 m
High flood discharge	600 cumecs
If the dimensions of the throat of the siphon are : width = 4 m and height = 2m determine the number of siphon units required to pass the flood safely. This siphon discharges freely in the air.	

Q6) a) Explain determination of settlement of earth dam embankments. **[6]**

b) Explain determination of settlement and lateral movements in dam. **[4]**

Q7) a) State common objectives of ICOLD and ICID. **[4]**

b) Explain functioning of global water partnership (GWP). **[6]**

Q8) a) What care is taken to protect dams from global warming effect? **[6]**

b) What provisions are made for project affected people? **[4]**

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Total No. of Questions : 8]

SEAT No. :

P3905

[5155]-155

[Total No. of Pages : 3

M.E. (Mechanical/Design/CAD/Manufacturing Engg.)

ADVANCED MATHEMATICS

(2013 Pattern) (507201) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Find an orthonormal basis for the Euclidean space \mathbb{R}^3 , by applying Gram - Schmidt's method to the following Vectors : (1, 1, 1), (6, 4, 5) and (3, 6, 9). [5]

b) Find the potential function ϕ , given the flux function $x = \tan^{-1} \frac{y}{x}$ and the complex function $f(z) = \phi + i\psi$. [5]

Q2) a) Evaluate $\oint_C \frac{(2z^2 - 1)}{(z-1)(z+1)(z-2)} dz$ where C is the circle $|z| = 2.5$. [5]

b) Find the Laplace Transform of the given function.
 $f(t) = t \sin 2t \mu(t-2) + e^{-2t} \cos 3t \delta(t-3)$ [5]

Q3) a) Solve the following differential equation by power series method: [5]

$$(1-x^2) \frac{d^2 y}{dx^2} - \frac{xdy}{dx} + 4y = 0$$

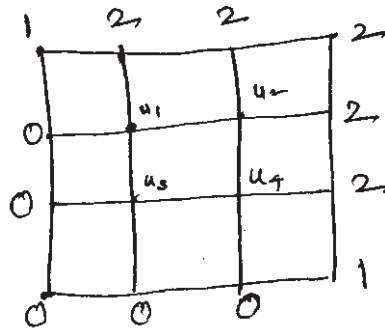
b) Using Laplace Transforms, find the solution of the initial value problem
 $\frac{d^2 y}{dx^2} + 9y = 9u(t-3)$, $y(0) = y'(0) = 0$ where $u(t-3)$ is the unit step function. [5]

P.T.O.

Q4) a) Find by power method the numerically largest eigen value of

$$A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix} \text{ with } X_0 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} \quad [5]$$

b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the square mesh with boundary values as shown in the following figure. [5]



Q5) a) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, subject to the conditions $u(x, 0) = \sin \pi x$, $0 \leq x \leq 1; u(0, t) = u(1, t) = 0$ carry out computation for 3 levels by taking $h = \frac{1}{4}$. [5]

b) Using Galerkin's method, solve the boundary value problem $\frac{d^2 y}{dx^2} = 3x + 4y$; $y(0) = 0$, $y(1) = 1$ taking $\phi(x) = x(2 - x)$. [5]

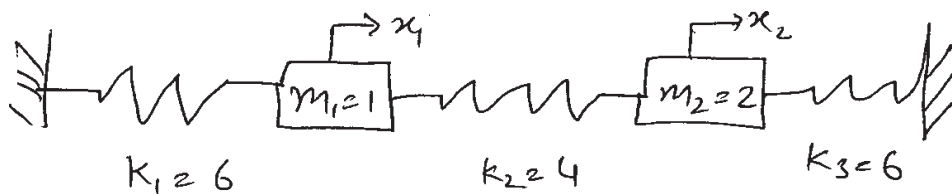
Q6) a) Find the extremal of the functional $\int_0^\pi [(y')^2 - y^2 + 4y \cos x] dx$, $y(0) = y(\pi) = 0$. [5]

b) Find the solution of the linear equation system by least square method $x - 2y = 1$, $x + y = 2$, $x + 2y = 4$ [5]

Q7) a) Find the map of the straight line $y = x$ under $W = \frac{z-1}{z+1}$. [5]

b) Find the Fourier cosine transform of $f(x) = \begin{cases} x & , \text{ for } 0 < x < 1 \\ 2-x & , \text{ for } 1 < x < 2 \\ 0 & , \text{ for } x > 2 \end{cases}$ [5]

Q8) a) The system shown in figure begins to vibrate. Assuming that there is no friction, determine the normal frequencies and normal modes of vibration. [5]



b) Solve the boundary value problem $U_{tt} = 25 U_{xx}$ with the boundary conditions $U(0,t) = U(5,t) = 0$ and initial conditions

$$U(x,0) = \begin{cases} 20x, & 0 \leq x \leq 1 \\ 5(5-x), & 1 \leq x \leq 5 \end{cases} \text{ and } U_t(x,0) = 0 \text{ by taking } h = 1 \text{ upto } t = 1. [5]$$

x x x

Total No. of Questions : 7]

SEAT No. :

P3906

[5155]- 156

[Total No. of Pages : 2

M.E. (Mechanical) (Design Engineering)
Material Science and Mechanical Behaviour of Materials
(2013 Pattern) (502202) (Semester - I)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any Five questions.*
- 2) *Neat diagrams must be drawn whenever 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 whenever necessary.*

Q1) A plate of iron is exposed to a carburizing (carbon-rich) atmosphere on one side and a decarburizing (carbon-deficient) atmosphere on the other side at 700°C. If a condition of steady state is achieved, calculate the diffusion flux of carbon through the plate if the concentrations of carbon at positions of 5 and 10 mm beneath the carburizing surface are 1.2 and 0.8 kg/m³, respectively. Assume a diffusion coefficient of 3×10^{-11} m²/s at this temperature. [10]

Q2) Explain need of different yield criteria and also explain types of yield criteria, yield surface for ductile and brittle material. [10]

Q3) To ensure that the neck in a tensile bar would occur at the middle of the gauge section, the machinist made the bar with a 50 mm. Diameter in the middle of the gauge section and machined the rest of it to a diameter of 50.5 mm. After testing, the diameter away from the neck was 47.0 mm. Assume that the stress-strain relation follows the power law, equation $\sigma = K\varepsilon^n$ What was the value of n? [10]

Q4) a) Explain Torsion test. [5]

b) Explain different models of uniaxial behaviour of material in plasticity.[5]

P.T.O.

Q5) The fully plastic Simply supported beam for a rectangular beam carry 50% greater bending moment than the maximum safe elastic bending moment-Justify. **[10]**

Q6) Explain factors that affect the yield strength of material. **[10]**

Q7) Compare elasticity and viscoelasticity. **[10]**



Total No. of Questions : 7]

SEAT No :

P 3907

[5155]-157

[Total No. of Pages :2

M.E. (Mechanical) (Design Engineering)
ADVANCED STRESS ANALYSIS
(2013 Credit Pattern) (Semester-I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions out of 7.*
- 2) *All the questions should be solved in one answer book and attach extra supplements if required.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of calculator is allowed.*
- 5) *Assume Suitable data if necessary, but state the assumptions clearly.*

Q1) A square plate of side a has a tensile stress in it described by **[10]**

$\sigma_x = Dy$ $\sigma_y = Ax$ and possibly some shear stress in addition.

Find a) Stress function.

b) Most general shear stress which can be associated with these tensile stress.

Q2) A circular plate ($E = 200\text{GPa}$, $\nu = 0.29$, Yield stress = 276 MPa) has a radius of 250 mm and thickness $h = 25\text{ mm}$. The plate is simply supported at the edges and is subjected to a uniform pressure p of 1.38 MPa . **[10]**

Determine the maximum bending stress in the plate and maximum deflection. Derive the equation for maximum deflection you use.

Q3) An important part of a structure which currently is being made of an aluminium alloy having a modulus of elasticity of 60 MPa is to be replaced by a composite material containing E-glass fibre in nylon matrix. **[10]**

Determine minimum volume fraction of glass fibre, if it is desired that while weight reduction is important, the specific modulus of the component should not be lower than that of the current material. The direction of loading in the composite will be in the fibre direction. The density of aluminium alloy used is 2800 kg/m^3 .

Material	Density (Kg/m^3)	Modulus of Elasticity (GPa)
E-glass	2550	72
Nylon	1140	2.8

P.T.O.

Q4) Derive an equilibrium equation in polar coordinate system. [10]

Q5) A three element rectangular rosette strain gauge is mounted on a steel specimen. For a particular state of loading of the structure the strain gauge readings are-

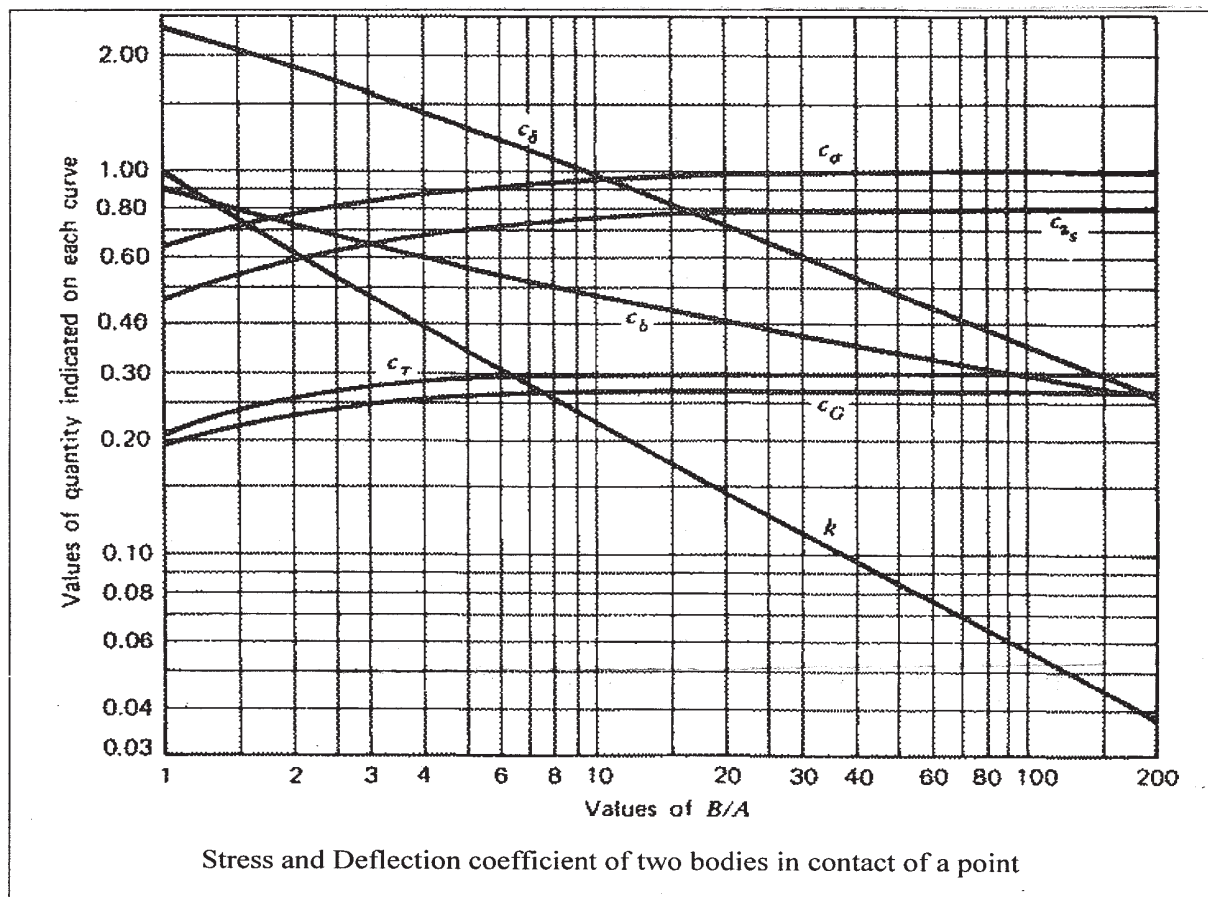
$$\epsilon_A = 200 \mu\text{m/m}, \epsilon_B = 900 \mu\text{m/m}, \epsilon_C = 1000 \mu\text{m/m},$$

Determine the values and orientation of the principal stresses and the values of the maximum shear stress at the point, Let $E = 200\text{GPa}$ and $\nu = 0.285$. [10]

Q6) A steel railway car wheel may be considered a cylinder with a radius of 440mm. The wheel rolls on a steel rail whose top surface may be considered another cylinder with a radius of 330 mm. For the steel wheel and steel rail, Young's modulus $E = 200\text{GPa}$ and Poisson's ratio $\nu = 0.285$ and yield stress $Y = 880\text{MPa}$. If the wheel load is 110 kN, determine the maximum Principal stress, maximum shear stress and maximum octahedral shear stress and the factor of safety against initiation of yielding based on the maximum shear stress criterion. [10]

Q7) a) Explain different criteria for stress analysis using plasticity approach. [5]

b) Explain different types of engineering plastics with suitable examples. [5]



Total No. of Questions : 7]

SEAT No. :

P3908

[5155]-158

[Total No. of Pages : 2

**M.E. (Mechanical) (Heat Power / Design / Mechatronics /
CAD / CAM / Energy Engineering)**

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams should be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of pocket calculator & different gas charts as applicable is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) What are the Characteristics of Good research? [5]
b) Discuss the eight step model for Research Process starting from formulation of research problem till research report writing. [5]
- Q2)** a) Discuss the significance of literature review in Research. [5]
b) What are the important considerations / parameters for formulating a Research Problem? [5]
- Q3)** a) What is Pilot study of a Research Problem? [5]
b) Discuss important steps for formulation of Research Problem. [5]
- Q4)** a) Discuss the different types of variables used in Research. [5]
b) Discuss the format / outline of Research Proposal and explain briefly each section. [5]
- Q5)** a) Explain the significance of curve fitting in Engineering Research. [5]
b) Discuss different methods for testing hypothesis. [5]

P.T.O.

Q6) a) Define: [5]

- i) Mean ii) Weighted mean iii) Median
- iv) Mode v) Measure of Central tendency.

b) Define: [5]

- i) Range, ii) Accuracy iii) Precision
- iv) Sensitivity v) Resolution, vi) Threshold / Dead zone.

Q7) a) Discuss Multiple Linear Regression Equation. [5]

b) Explain the structure for writing a research report. [5]



Total No. of Questions :7]

SEAT No. :

P3909

[Total No. of Pages :3

[5155] - 159

M.E. (Mechanical Design Engineering)
ANALYSIS AND SYNTHESIS OF MECHANISMS
(2013 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions .*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data whenever necessary.*

Q1) a) Design a four bar mechanism which will satisfy the following precision conditions **[7]**

$$\omega_1 = 8 \text{ rad/sec}$$

$$\alpha_1 = 0 \text{ rad/sec}^2$$

$$\omega_2 = 1 \text{ rad/sec}$$

$$\alpha_2 = 20 \text{ rad/sec}^2$$

$$\omega_3 = 6 \text{ rad/sec}$$

$$\alpha_3 = 0 \text{ rad/sec}^2$$

Also draw the mechanism.

b) Write a short note on Dyad. **[3]**

Q2) A mechanism is shown in Fig. 01, the dimensions of different link are as given below $O_2A = 7.5 \text{ cm}$, $AB = 5 \text{ cm}$, $BC = 7.5 \text{ cm}$, $O_5C = 6.5 \text{ cm}$ (is vertical) $CD = 10 \text{ cm}$ $BD = 5 \text{ cm}$ $O_6D = 5 \text{ cm}$ Angle $O_2AB = 110^\circ$, Angle $ABC = 115^\circ$ Angle $O_6DB = 117^\circ$ $\omega_2 = 10 \text{ rad/sec}$ (Clockwise). Using relative velocity method determine angular velocity of link O_6D (ω_6) **[10]**

P.T.O.

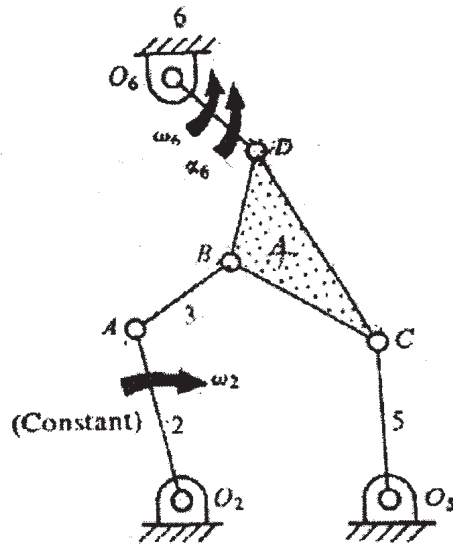


Fig. 01

Q3) Write short note on any two of the following: [10]

- a) Auxiliary Point Method for Mechanism Analysis.
- b) Cubics of Stationary Curvature.
- c) Branch and Order Defect.

Q4) a) What are ‘Elastic mechanisms’? Discuss the dynamic analysis of elastic mechanism. [5]

b) Explain the effect of inertia on force analysis of mechanism. [5]

Q5) A straight line mechanism is shown in Fig. 0.2. Find the inflection circle for the motion of the coupler. Also determine radius of curvature of coupler point B $O_2A = AC = AB = 100\text{mm}$. [10]

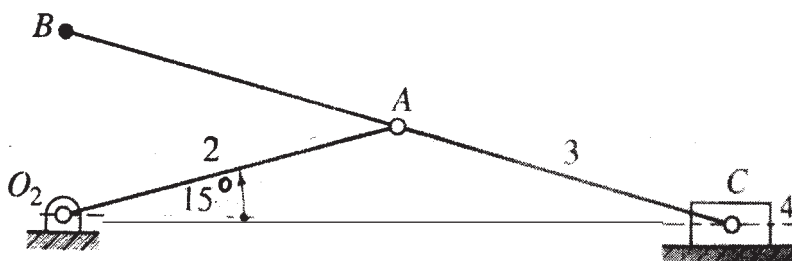


Fig. 02

Q6) Synthesize a four bar mechanism to generate a function $y = x^2 - x$ where $1 \leq x \leq 4$. Assuming initial and final positions of input link at 30° and 120° respectively whereas for output link 70° and 160° respectively. Determine x , y , θ ϕ corresponding to three precision positions. The grounded link is horizontal and of 100 mm length, input link is 40 mm long. [10]

Q7) a) Explain Matrix method of analysis of spatial mechanisms. [5]

b) Explain in detail Hartmann construction. [5]

EEE

Total No. of Questions : 7]

SEAT No :

P 3910

[5155]-160

[Total No. of Pages :3

M.E. (Mechanical) (Design Engineering)
ADVANCED MECHANICAL VIBRATIONS
(2013 Credit Pattern) (502208) (Semester-II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Use of non-programmable scientific calculator is allowed.*
- 4) *Assume suitable data wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Find the natural Frequency and mode shapes of three degree of freedom system as shown in Fig. No. 1 using matrix method (Eigen values and Eigen vector). [10]

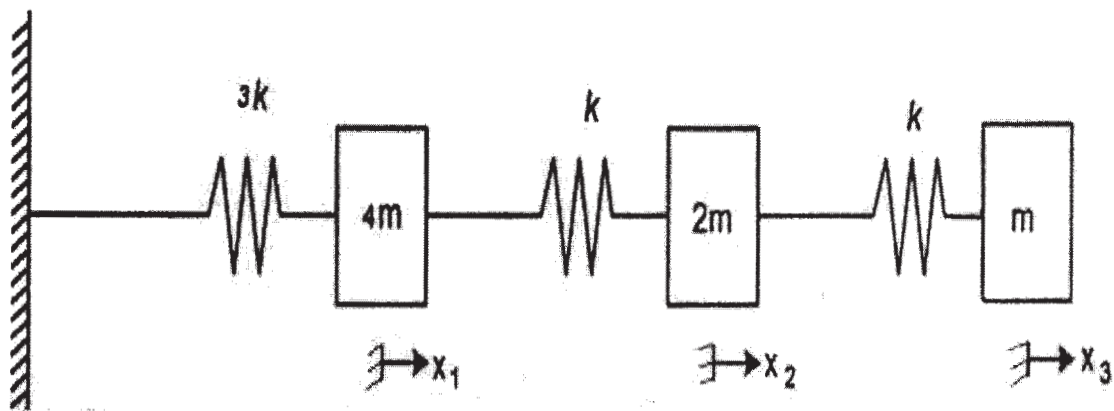
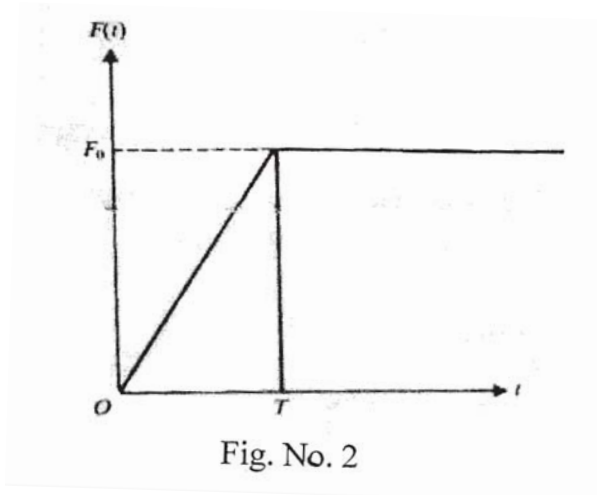


Fig. Q. 1

Q2) Find frequency equation of a uniform beam fixed at one end and free at the other for transverse vibration. [10]

P.T.O.

- Q3) a)** Determine the forced response of the un-damped single degree of freedom system to the forcing function shown in Fig.No.2. [5]



- b)** Determine flexibility influence coefficient of the triple pendulum of lengths L_1, L_2, L_3 and masses m_1, m_2, m_3 attached by the string as shown in Figure No.3. [5]

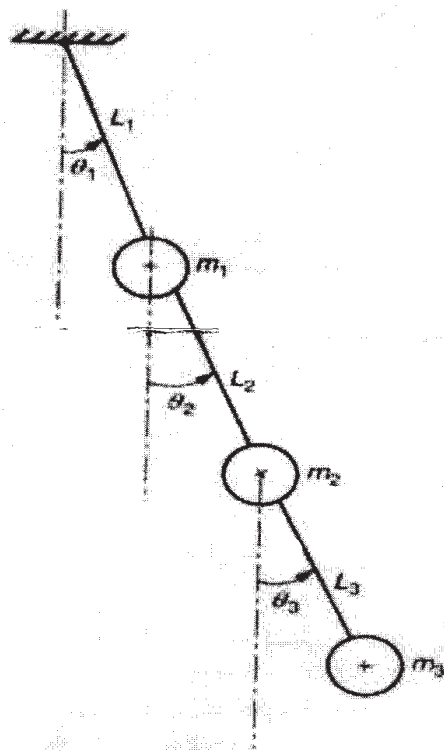


Figure No. 3

- Q4)** Analyze un-damped dynamic vibration absorber and show frequency response for main system and absorber system. [10]

Q5) a) Explain how time domain and frequency domain techniques are used for condition monitoring. [5]

b) Explain FFT analyzer with a block diagram. [5]

Q6) a) How are the mean square value, auto correlation function and power spectral density function of a stationary random process related? [5]

b) Explain with neat sketch wide-band and narrow band processes. Define white noise, ideal noise and band limited noise. [5]

Q7) Write notes on (Any Four). [10]

a) Holzer Method

b) Rayleigh's method

c) Duhamel's Integral

d) Fault diagnosis

e) Continuous system and its characteristics



Total No. of Questions : 7]

SEAT No. :

P3911

[5155]-161

[Total No. of Pages : 2

M.E. (Mech.-Design)
FINITE ELEMENT METHOD
(2013 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

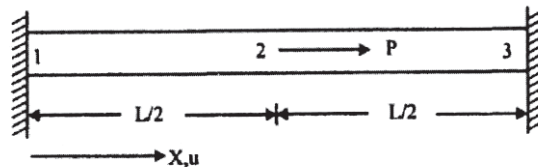
Instructions to the candidates:

- 1) *Answer any Five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if required.*

Q1) Write a note on Penalty and Elimination Approach for Solution of FEA equations. **[10]**

Q2) Calculate the displacement at node 2 of a fixed beam shown in Fig. Subjected to an axial load 'P' at node 2 **[10]**

Q3) Determine the nodal displacements and element stresses by finite element formulation for the following figure. Use $P = 300 \text{ kN}$; $A_1 = 0.5 \text{ m}^2$; $A_2 = 1 \text{ m}^2$; $E = 200 \text{ GPa}$. Use RAYLEIGH - RITZ METHOD. **[10]**



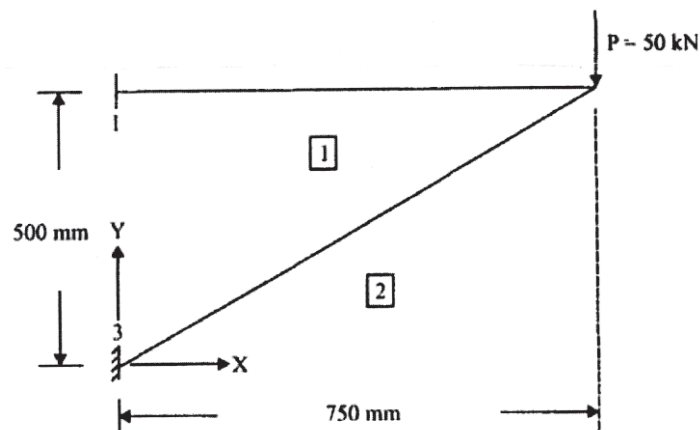
Q4) Explain convergence requirements in Finite Element formulations and also write a note on Newtons Cotese Formula. **[10]**

Q5) Write a note on following (Any Two) **[10]**

- a) Kirchoffs Plate Bending theory.
- b) Mindlin Plate Element.
- c) Degenerated Shell Element.

P.T.O.

Q6) Determine the stiffness matrix, stresses and reactions in the truss structures shown below, assuming points 1 and 3 are fixed. Use $E = 200 \text{ GPa}$ and $A = 1000 \text{ mm}^2$. **[10]**



Q7) Write a Note (any Four)

[10]

- a) NR method for Nonlinear FEA.
- b) Consistent and Lumped Mass Matrices.
- c) Mode Superposition Scheme.
- d) Submodelling and substructuring.
- e) h & P refinements.



Total No. of Questions :6]

SEAT No. :

P3912

[Total No. of Pages :3

[5155] - 162

M.E. (Mechanical-Design Engineering)

OPTIMIZATION TECHNIQUES

(2013 Credit Pattern) (Semester - III) (602213)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Attempt any five questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data if necessary.

Q1) a) Explain in brief classification of optimization problem. [5]

- b) A uniform column of rectangular cross section is to be constructed for supporting a water tank of mass M as shown in Fig. 1. It is required to minimize the mass of the column for economy, and to maximize the natural frequency of transverse vibration of the system for avoiding possible resonance due to wind. Formulate the problem of designing the column to avoid failure due to direct compression and buckling. Assume the permissible compressive stress to be σ_{\max} . [5]

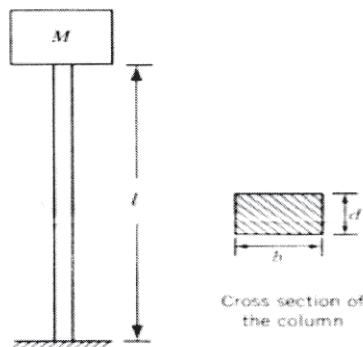


Fig.1

OR

P.T.O.

- b) In a two-stage compressor, the working gas leaving the first stage of compression is cooled (by passing it through a heat exchanger) before it enters the second stage of compression to increase the efficiency. The total work input to a compressor (W) for an ideal gas, for isentropic compression, is given by [5]

$$W = c_p T_1 \left[\left(\frac{p_2}{p_1} \right)^{\frac{k-1}{k}} + \left(\frac{p_3}{p_2} \right)^{\frac{k-1}{k}} - 2 \right] \frac{k}{k-1}$$

where C_p is the specific heat of the gas at constant pressure, k is the ratio of specific heat at constant pressure to that at constant volume of the gas, and T_1 is the temperature at which the gas enters the compressor. Find the pressure, p_2 , at which inter-cooling should be done to minimize the work input to the compressor. Also determine the minimum work done on the compressor. [5]

Q2) a) Define the following:

- i) Design vector.
 - ii) Design constraints
 - iii) Constraint surface
 - iv) Objective function
 - v) Saddle point
- b) What are the advantages and disadvantages of simplex method? Also, state its applications. [5]

OR

- b) Find the Extreme point of the function [5]

$$f(x_1, x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$$

Q3) a) Minimize the function **[5]**

$$f(x) = 4x^3 + x^2 - 7x + 14$$

Using Golden Section Method, in the interval of [0, 1] with n=5.

b) Explain the Random search methods and advantages of random search methods. **[5]**

Q4) a) Explain any two in details: **[6]**

i) Neural-Network-based methods.

ii) Simulated Annealing.

iii) Genetic algorithms.

b) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ from the starting point

$$X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix} \text{ using Powell's Method.} \quad \text{[4]}$$

Q5) a) What are the different methods involved in problem formulation and parameterization of design? Explain one method in details. **[5]**

b) Write a short note on Bi-directional evolutionary structural optimization based on Von mises stress. **[5]**

Q6) a) Write a short note on Bi-directional evolutionary optimization method. **[5]**

b) Write a short note on Topology optimization as design tool. **[5]**

EEE

Total No. of Questions : 8]

SEAT No. :

P3913

[5155]-163

[Total No. of Pages : 2

M.E. (Mechanical - Design Engg.)
MECHANICAL MEASUREMENT OF CONTROL
(2013 Course) (Semester -III) (602214)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

Q1) a) Explain Classification of measuring instruments. **[5]**

b) Explain any five static characteristics of instruments. **[5]**

Q2) a) Calculate standard deviation (σ) and variance (V) for following measurement sets 398 420 394 416 404 408 400 420 396 413 430 410 411 416 401 400 407 403 399 406 401. **[6]**

b) How Systematic Errors can be removed? **[4]**

Q3) a) By using following data find lines of regression & Compute Karl Pearson coefficient of correlation. **[6]**

$$\sum x = 15000 \quad \sum y = 6800 \quad \sum xy = 1022250 \quad \sum x^2 = 2272500$$

$$\sum y^2 = 463025$$

$$n = 100$$

b) Explain different types of correlation. **[4]**

Q4) a) Explain construction & working of Foil type heat flux gage. **[5]**

b) Explain any hygrometer used for humidity measurement. **[5]**

P.T.O.

- Q5) a)** Explain any one dynamometer used for torque measurement. [5]
- b) Write note on Phase-Angle Measurement. [5]

- Q6) a)** Represent a generic state space model using the block diagram approach and define the elements of the block diagram. [5]
- b) Differentiate between the Time Domain and the Frequency Domain based modelling approach. [5]

- Q7) a)** Using Routh-Hurwitz criterion find closed loop stability of system given below. [5]

$$\frac{C(s)}{R(s)} = \frac{2s + 1}{S^3 + 3s^2 + 3s + 1}$$

- b) Derive the transfer function between output y and input F for the single DOF translational mechanical system shown in Figure Q7 (b) [5]

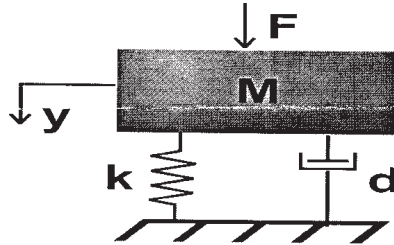


Figure Q7 (B)

- Q8) a)** Explain Proportional + Derivative control action. [5]
- b) The equation of error is $e = 0.5t + 0.03t^2$. With $K_p = 5\%/%$, $K_D = 0.5 \%/s$ and $m(0) = 50\%$. Sketch the graph of controller output vs time or P+D controller (in series form) from $t = 0$ to $t = 2\text{sec}$. [5]

⊗ ⊗ ⊗

Total No. of Questions : 8]

SEAT No. :

P3914

[5155]-164

[Total No. of Pages : 3

M.E. (Mechanical) (Heat Power/Energy) (Credit system)
ADVANCED MATHEMATICS AND NUMERICAL METHODS
(2013 Pattern) (507101)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 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) *Assume suitable data, if necessary.*

Q1) a) Find the smallest positive root of the equation $x^3 - 5x + 1 = 0$ by Muller's method (perform four iterations) **[5]**

b) Find the best possible values of a, b in the relation $v = at^b$ from the table **[5]**

v feet/min	350	400	500	600
t (min)	61	26	7	2.6

Q2) a) Use LU Decomposition method **[5]**

Solve $x + y + z = 1$

$$4x + 3y - z = 6$$

$$3x + 5y + 3z = 4$$

b) Find Lagrange's interpolating polynomial for the data: **[5]**

x	2	2.5	3.0
log x	0.69315	0.91629	1.09861

Also estimate the error.

Q3) a) Determine the Hermite interpolating polynomial which fits the following data: **[5]**

x	0	1	2
y	1	3	21
y'	0	6	36

P.T.O.

- b) Using Newton's divided difference formula, find the maximum value of $f(x)$ using the following data. [5]

x	-1	1	2	3
$f(x)$	-21	15	12	3

- Q4)** a) Find value of $\int_1^4 (x^3 + x - 1)$ using Gauss - Legendre two point formula. [5]
 b) Determine the largest eigenvalue and the corresponding eigenvector of the following matrix using power method. [5]

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

- Q5)** a) Using Householders method reduce the following matrix A given by

$$A = \begin{bmatrix} 1 & 3 & 4 \\ 3 & 2 & -1 \\ 4 & -1 & 1 \end{bmatrix} \text{ to the tridiagonal form. [5]}$$

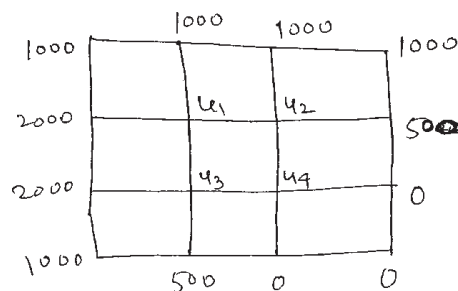
- b) Compute $y(0.3)$ using Range-kutta method of fourth order, given that [5]

$$\frac{dy}{dx} + y + xy^2 = 0$$

$$y(0.1) = 0.9006, \text{ taking } h = 0.1$$

- Q6)** a) Using Adam's Bashforth predictor corrector method find $y(0.4)$. Given that $\frac{dy}{dx} = \frac{xy}{2}$, $y(0) = 1$, $y(0.1) = 1.01$, $y(0.2) = 1.022$, $y(0.3) = 1.023$. [5]

- b) Solve the partial differential equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, represented by mechanical system, using Jacobi's method (carry out five iterations to find u_1, u_2, u_3, u_4). Given that [5]



Q7) a) Solve by Gauss seidal iteration method, the system of equations: **[5]**

$$8x - 3y + 2z = 20$$

$$6x + 3y + 12z = 35$$

$$4x + 11y - z = 33$$

b) Solve the elliptic equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the following square mesh with boundary values as shown in figure; Iterate until the maximum difference between two successive values at any point is less than 0.001. **[5]**

Q8) a) Solve the wave equation $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$ up to $t = 0.5$ with spacing of 0.1 subject to **[5]**

i) $y(0, t) = 0$

ii) $y(1, t) = 0$

iii) $\frac{\partial y}{\partial t} = 0$ at $t = 0$

iv) $y(x, 0) = 10 + x(1 - x)$

b) Explain shooting method to solve boundary value problem $\frac{d^2 y}{dx^2} = y(x)$, with $y(a) = A, y(b) = B$. **[5]**

x x x

Total No. of Questions :8]

SEAT No. :

P3915

[5155]-165

[Total No. of Pages :3

M.E.(Mechanical) (Heat Power Engineering)
ADVANCED THERMODYNAMICS & COMBUSTION
TECHNOLOGY
(2013 Pattern) (Semester-I) (502102)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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 calculators and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) A cylindrical tank containing 4.0 kg of carbon monoxide gas at -50°C has an inner diameter of 0.2 m and a length of 1 m. Determine the pressure, in bar, exerted by the gas using **[6]**

- i) The generalized compressibility chart,
- ii) The ideal gas equation of state,
- iii) The van der Waals equation of state.

Critical Properties: $T_c = 133\text{K}$, $P_c = 35\text{ bar}$

Van der Waal's constants: $a = 1.474\text{ bar} \cdot \text{m}^6 / \text{kmol}^2$

$b = 0.0395\text{ m}^3 / \text{kmol}$

b) Explain: Law of Corresponding States. **[4]**

Q2) a) State: **[3]**

- i) Second Law Efficiency,
- ii) Third Law of Thermodynamics

b) Write a note on p- V- T surface. **[4]**

P.T.O.

- c) A 0.3 kg metal bar initially at 1200 K is removed from an oven and quenched by immersing it in a closed tank containing 9 kg of water initially at 300 K. Each substance can be modeled as incompressible. An appropriate constant specific heat value for the water is 4.2 kJ/kg. K, and an appropriate value for the metal is 0.42 kJ/kg. K, Heat transfer from the tank contents can be neglected. Determine the amount of entropy produced, in kJ/K. [3]

- Q3)** a) Derive an expression for loss in availability when heat is transferred through a finite temperature difference. [4]
- b) Air is available at 10 bar and 1500 K for expansion through an adiabatic turbine. At the exit, the air pressure is 1 bar and temperature is 900 K. What maximum possible work this turbine can produce? Also find irreversibility and Second Law Efficiency. The ambient conditions are 1 bar and 300 K. Neglect KE and PE changes. Assume $1.4 C_v = C_p = 1.0045 \text{ kJ/Kg.K}$. [6]

- Q4)** a) Write a note on 'Nerst heat theorem and thermal death of universe'. [5]
- b) Calculate availability of air at following states. [5]
- Pressure 700 kPa, Temperature 200° C,
 - Pressure 980 kPa, Temperature–Ambient
- Surroundings are at pressure 103 kPa and 288 K.

- Q5)** a) State and prove Cyclic Formula. [5]
- b) With usual notations derive the following thermodynamic relation: [5]

$$C_p - C_v = TV\beta^2 / \kappa_T$$

- Q6)** a) What is adiabatic flame temperature? [4]
- b) Determine the enthalpy of combustion of methane, in kJ per kg of fuel, at 25°C, 1 atm with liquid water in the products. [6]
- Take: Enthalpy of formation at 25°C and 1 atm for
- $\text{CO}_2 = -393520 \text{ kJ/kmol}$,
 - $\text{H}_2\text{O} = -285830 \text{ kJ/kmol}$, and
 - $\text{CH}_4 = -74580 \text{ kJ/kmol}$

Q7) a) Explain: [4]

- i) Kay's Rule and
- ii) Daltons law of partial pressure

b) The molar analysis of the gaseous products of combustion of a certain hydrocarbon fuel is CO_2 , 0.08; H_2O , 0.11; O_2 , 0.2, 0.07, and N_2 , 0.74. [6]

Determine the apparent molecular weight of the mixture and the composition in terms of mass fractions.

Q8) a) Discuss: Thermodynamics of Aging and Death. [4]

b) Write short note on: [6]

- i) Thermodynamics of Nutrition and Exercise
- ii) Gibb's phase rule



Total No. of Questions : 7]

SEAT No :

P 3916

[5155]-166

[Total No. of Pages :2

**M.E. (Mechanical - Heat Power)
ADVANCED FLUID MECHANICS
(2013 Course) (502103) (Semester-I)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions from following.*
- 2) *Draw diagrams wherever necessary.*
- 3) *Use of scientific calculator is allowed.*
- 4) *Assume suitable data where ever necessary.*

Q1) a) Derive a generalized expression for total derivative and deduce the same for velocity, density, temperature and pressure. **[5]**

b) Derive an expression for conservation of mass and momentum using differential analysis. **[5]**

Q2) a) Obtain exact solution of fully developed flow through pipe. **[5]**

b) Steel sphere of 4 mm dia. falls in glycerine at a terminal velocity of 0.04 m/s. Assuming Stokes law is applicable, determine **[5]**

i) Dynamic viscosity of glycerine

ii) Drag force, and

iii) Drag coefficient for the sphere

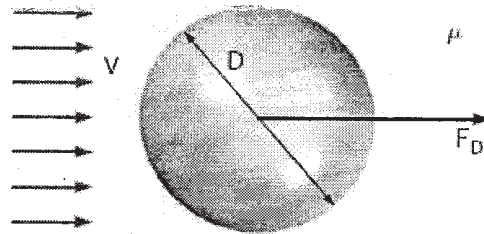
Take sp. wt. of steel and glycerine as 75 kN/m^3 and 12.5 kN/m^3 .

Q3) a) Deduce the expression of Bernoulli Equation from Navier Stokes equation. **[5]**

b) The flat plate is moving at a velocity of $U = 15 \text{ m/s}$ on top of a 15 mm thick oil film. The density of the oil is 920 kg/m^3 and dynamic viscosity, $\mu = 0.8 \text{ kg/m.s}$. Also there is a favorable pressure gradient of $-3\mu U/h^2$. Calculate the average and maximum forward velocity of the oil film, the flow rate, the force required to pull the upper plate (per m^2). 'h' is the distance between moving plate and stationary plate. Assume laminar flow between the plates. **[5]**

P.T.O.

- Q4) a)** A volcano has erupted, spewing stones, steam, and ash several thousand feet into the atmosphere (Fig.). After some time, the particles begin to settle to the ground. Consider a nearly spherical ash particle of diameter 50 mm, falling in air whose temperature is -50°C and whose pressure is 55 kPa. The density of the particle is 1240 kg/m^3 . Estimate the terminal velocity of this particle at this altitude. [5]



- b) Explain the four simple Potential flows with graphical representations. [5]

- Q5) a)** Obtain momentum-integral equation for the boundary layer. [5]

- b) Following are parametric forms of three velocity profiles over a stationary surface. Check whether the flow adheres to or detaches from the surface.

$$\frac{u}{U_{\infty}} = \frac{3}{2}\eta - \frac{1}{2}\eta^3. \quad [5]$$

$$\frac{u}{U_{\infty}} = -\frac{3}{2}\eta + \frac{1}{2}\eta^3 + \eta^4.$$

$$\frac{u}{U_{\infty}} = 2\eta^2 + \eta^3 - 2\eta^4 \quad \text{Where } \eta = y / \delta$$

- Q6) a)** Explain different types of free turbulent flows. What is a need of turbulence modeling? [5]

- b) Derive an expression for universal velocity distribution law in pipe flow. [5]

- Q7) a)** Derive an expression for speed of sound. What is the Mach number of flow of air of velocity 200 m/s at 400K? State the types of flow. [5]

- b) Derive an expression for Fanno line & Rayleigh line for normal shock. [5]



Total No. of Questions :7]

SEAT No. :

P3917

[Total No. of Pages :3

[5155] - 167

**M.E. (Mechanical - Heat Power)
ADVANCED HEAT TRANSFER
(2013 Course) (Semester - II) (502107)**

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer five questions from following.*
- 2) *Draw diagrams wherever necessary.*
- 3) *Use of scientific calculator is allowed.*
- 4) *Assume suitable data wherever necessary.*

Q1) a) Explain boundary and initial conditions for heat diffusion equation. **[5]**

b) One-dimensional steady state conduction with uniform internal energy generation occurs in a plane wall with a thickness of 50 mm and a constant thermal conductivity of 5 W/m. K. For these conditions, the temperature distribution has the form, $T(x) = a + bx + cx^2$. The surface at $x = 0$ has temperature of $T(0) = T_0 = 120^\circ\text{C}$ and experiences convection with a fluid for which $T_\infty = 20^\circ\text{C}$ and $h = 500 \text{ W/m}^2\cdot\text{K}$. The surface at $x = L$ is well insulated. **[5]**

- i) Applying an overall energy balance to the wall, calculate the internal energy generation rate q_g .
- ii) Determine the coefficients a , b , and c by applying the boundary conditions to the prescribed temperature distribution.

Q2) a) Explain various dimensionless parameters associated with transient conduction. **[5]**

b) To warm up some milk for a baby, a mother pours milk into a thin-walled glass whose diameter is 6 cm. The height of the milk in the glass is 7 cm. She then places the glass into a large pan filled with hot water at 60°C . The milk is stirred constantly, so that its temperature is uniform at all times. If the heat transfer coefficient between the water and the glass is $120 \text{ W/m}^2\cdot^\circ\text{C}$, determine how long it will take for the milk to warm up from 3°C to 38°C . Take the properties of the milk to be the same as those of water. **[5]**

P.T.O.

- Q3) a)** Discuss analogies between momentum and heat transfer. [5]
- b) Differentiate between velocity and thermal boundary layer. [5]
- Q4) a)** Discuss pressure, velocity and heat transfer variation for flow over cylinder. [5]
- b) Engine oil at 60°C flows over the upper surface of a 5-m long flat plate whose temperature is 20°C with a velocity of 2 m/s. Determine the total drag force and the rate of heat transfer per unit width of the entire plate. [k = 0.144 W/m-K Pr = 2870, $\nu = 242 \times 10^{-6}$ m²/s, $\rho = 876$ kg/m³] [5]
- Q5) a)** Explain governing equation for natural convection for heat transfer over vertical flat surface. [5]
- b) A 12-cm-high and 20-cm-wide circuit board houses 100 closely spaced logic chips on its surface, each dissipating 0.05 W. The board is cooled by a fan that blows air over the hot surface of the board at 35°C at a velocity of 0.5 m/s. The heat transfer from the back surface of the board is negligible. Determine the average temperature on the surface of the circuit board assuming the air flows vertically upwards along the 12-cm-long side by [5]
- i) ignoring natural convection and
- ii) considering the contribution of natural convection.
- Disregard any heat transfer by radiation.
- $k = 0.02717$ W/m-K Pr = 0.7235, $\nu = 1.774 \times 10^{-5}$ m²/s, $\beta = 0.00312$ K⁻¹
- Q6)** Derive an expression for heat transfer coefficient for laminar film condensation over vertical flat plate. [10]
- Q7) a)** Explain the terms Absorptivity, Reflectivity, and Transmissivity. [5]
- b) The temperature of the filament of an incandescent light bulb is 2500 K. Assuming the filament to be a blackbody, determine the fraction of the radiant energy emitted by the filament that falls in the visible range. Also, determine the wavelength at which the emission of radiation from the filament peaks. The visible range of the electromagnetic spectrum extends from $\lambda_1 = 0.4$ μ m to $\lambda_2 = 0.76$ μ m. (Refer table). [5]

Table: Blackbody radiation functions

$\lambda T,$ $\mu\text{m} \cdot \text{K}$	f_λ	$\lambda T,$ $\mu\text{m} \cdot \text{K}$	f_λ
200	0.000000	6200	0.754140
400	0.000000	6400	0.769234
600	0.000000	6600	0.783199
800	0.000016	6800	0.796129
1000	0.000321	7000	0.808109
1200	0.002134	7200	0.819217
1400	0.007790	7400	0.829527
1600	0.019718	7600	0.839102
1800	0.039341	7800	0.848005
2000	0.066728	8000	0.856288
2200	0.100888	8500	0.874608
2400	0.140256	9000	0.890029
2600	0.183120	9500	0.903085
2800	0.227897	10,000	0.914199
3000	0.273232	10,500	0.923710
3200	0.318102	11,000	0.931890
3400	0.361735	11,500	0.939959
3600	0.403607	12,000	0.945098
3800	0.443382	13,000	0.955139
4000	0.480877	14,000	0.962898
4200	0.516014	15,000	0.969981
4400	0.548796	16,000	0.973814
4600	0.579280	18,000	0.980860
4800	0.607559	20,000	0.985602
5000	0.633747	25,000	0.992215
5200	0.658970	30,000	0.995340
5400	0.680360	40,000	0.997967
5600	0.701046	50,000	0.998953
5800	0.720158	75,000	0.999713
6000	0.737818	100,000	0.999905

EEE

Total No. of Questions : 7]

SEAT No :

P 3918

[5155]-168

[Total No. of Pages :4

M.E. (Mechanical - Heat Power Engineering)
AIR CONDITIONING TECHNOLOGY
(2013 Course) (Semester-II) (502108)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any 5 questions out of 7.*
- 2) Draw neat diagrams wherever necessary.*
- 3) Use of Steam tables, p-h chart, Psychrometric chart and scientific calculator is allowed.*
- 4) Assume suitable data where ever necessary.*
- 5) Figures to the right indicate full marks.*

Q1) Conditions of air entering the coil is 40°C DBT and 25°C WBT and leaving the coil is 24°C DBT and 18°C WBT. Air quantity is 28 m³/min. Evaluate the performance of coil by calculating: **[10]**

- a) Cooling coil capacity in TR
- b) Sensible heat removed by the coil
- c) Latent heat removed by the coil
- d) ADP
- e) Coil bypass factor

Q2) The following information is related to a Laboratory applications. **[10]**

Outdoor design: 32°C DBT, 13 gms/kg of dry air

Indoor design: 24°C DBT, 10 gms/kg of dry air

RSH = 35kW, RLH = 19kW, Ventilation air quantity: 71 m³/min.

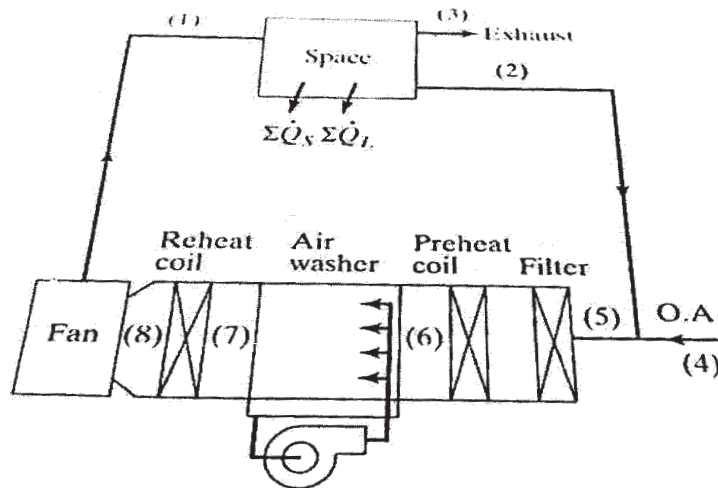
The temperature difference between room air and supply air is 11°C maximum.

Find: a) ESHF, b) ADP, c) Reheat required with revised ESHF = 0.74, d) Supply air quantity, e) Grand total heat.

P.T.O.

Q3) A building is heated and humidified using system as shown in the figure below. The building has sensible heat loss of 260 kW and a latent heat loss of 29 kW. The building space is maintained at 20°C DBT and 40% RH. Outside air is at 3°C DBT and 30% RH. 45% of the mass flow rate of dry air supplied to the space is outside air. The supply air is at DBT of 35°C. The air existing the air washer is at 80% RH. [10]

- a) Sketch and label all the processes on the psychrometric chart
- b) Calculate the rate of heat addition to the moist air by the preheat coil
- c) Calculate the rate of moisture addition by the air washer
- d) Calculate the rate of heat addition to the moist air by the reheat coil



- Q4)** a) Compare single stage and two stage evaporative cooling using Psychrometric chart. [5]
- b) Desert air cooler is used to cool the air from 40°C DBT and 15% RH to 25°C by Evaporative cooling. Estimate the volume flow rate of air in m³/min and the quantity of water required per hour for a cooling capacity of 4 TR. Assume efficiency of evaporative cooler as 90%. [5]
- Q5)** a) WBT is important for evaporative cooling applications. Do you agree? Justify your answer. [5]
- b) Why controls are necessary in air conditioning applications? Justify your answer with few examples. [5]

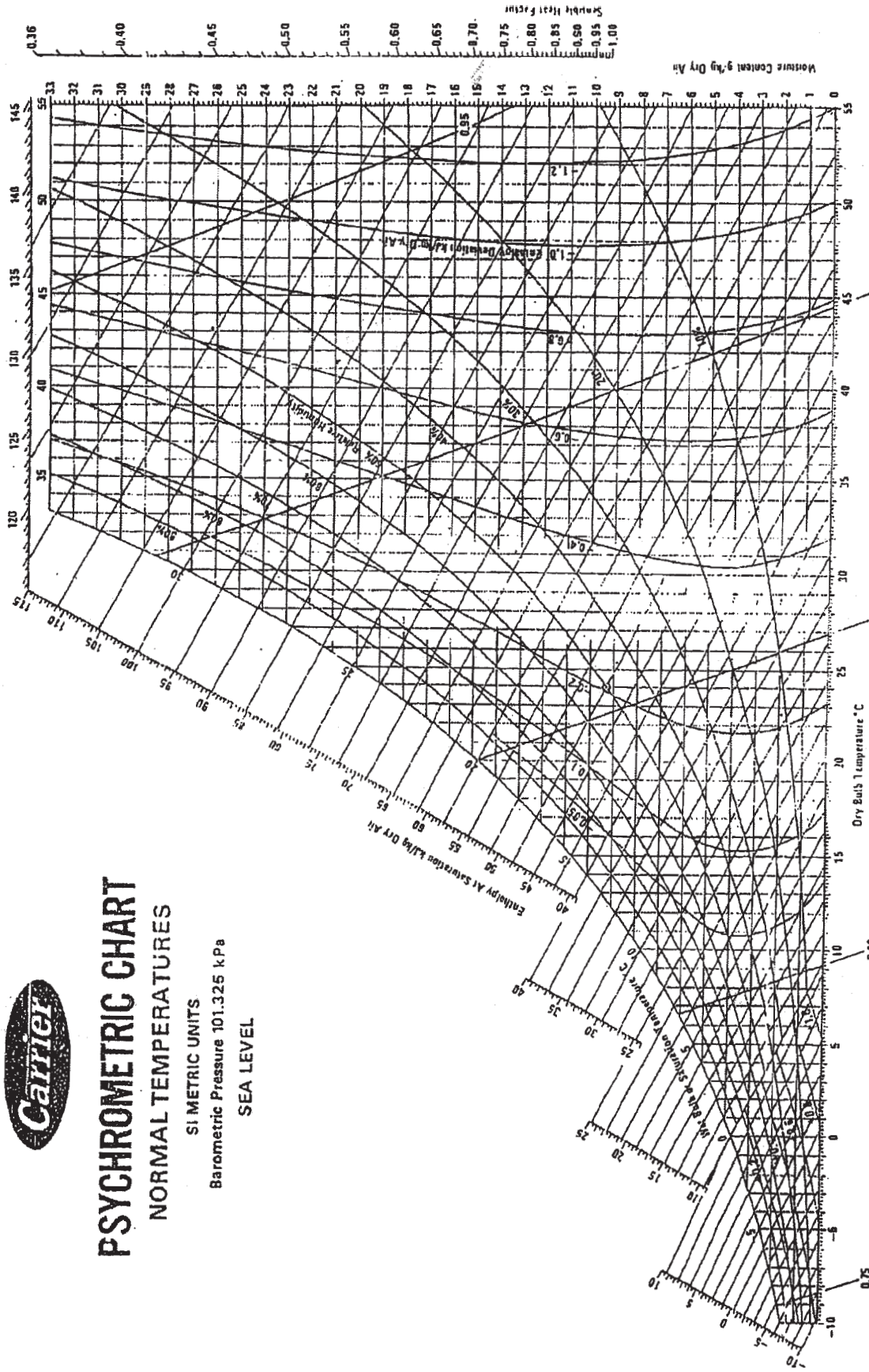
- Q6)** a) What are the important considerations for hospital air conditioning? **[5]**
b) Compare Centrifugal and Axial fans for air conditioning application. **[5]**
- Q7)** a) Differentiate between: **[6]**
i) Infiltration and Ventilation
ii) DPT and WBT
- b) What are the references for selecting outdoor and indoor climatic conditions while performing air conditioning load calculations? **[4]**



PSYCHROMETRIC CHART

NORMAL TEMPERATURES

SI METRIC UNITS
 Barometric Pressure 101.325 kPa
 SEA LEVEL



Below 0°C Properties and Enthalpy Deviation Lines Are For Ice

Rev. 6/81

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Total No. of Questions : 7]

SEAT No. :

P3919

[5155]-169

[Total No. of Pages : 3

M.E. (Mechanical Engineering) (Heat Power Engineering)

MEASUREMENT AND CONTROLS

(2013 Course) (Semester - II) (502109)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any FIVE questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator, heat transfer data book, steam table is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) The measurements in a data set are subject to random errors but it is known that the data set fits a Gaussian distribution. Use standard Gaussian tables to determine the percentage of measurements that lie within the boundaries of $\pm 1.5\sigma$, where σ is the standard deviation of the measurements. **[6]**

How many measurements have a deviation greater than $|\sigma|$ and $|2\sigma|$?

b) Write down an expression for a Gaussian probability density function of given mean value μ and standard deviation σ and show how you would obtain the best estimate of these two quantities from a sample of population n . **[4]**

Q2) a) The density (d) of a liquid is calculated by measuring its depth (c) in a calibrated rectangular tank and then emptying it into a mass measuring system. The length and width of the tank are (a) and (b) respectively and thus the density is given by: **[5]**

$$d = m/(a \times b \times c)$$

Where m is the measured mass of the liquid emptied out.

If the possible errors in the measurements of a , b , c and m are 1%, 1%, 2% and 0.5% respectively, determine the likely maximum possible error in the calculated value of the density (d).

b) How can statistical analysis be used to estimate experimental uncertainty? Explain coefficient of determination. **[5]**

P.T.O.

- Q3)** a) With neat diagram explain the working of the McLeod Guage. [5]
b) How thermal conductivity of gases at high temperature is measured? Explain with the help of neat diagram. [5]
- Q4)** a) Design a control system for temperature control in boiler. [6]
b) List the instruments for liquid level measurement. Explain the working of any of them. [4]
- Q5)** a) Discuss the procedure to calibrate the pressure gauge. [5]
b) What is the operating principle of the Saybolt viscosimeter? Explain giving its schematic. [5]
- Q6)** a) What kinds of problems can be encountered in thermocouple use? Explain in detail. [5]
b) Discuss the sources and treatment of random errors. [5]
- Q7)** a) Give comparison between hydraulic and pneumatic controller. [5]
b) Describe PI mode of control in hydraulic control system. [5]

Table 1: Standard Gaussian Table

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
	$F(z)$									
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7703	0.7734	0.7764	0.7793	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8906	0.8925	0.8943	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9648	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9924	0.9926	0.9928	0.9930	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964



[5155]-170
M.E. (Mechanical)
COMPUTATIONAL FLUID DYNAMICS
(2013 Pattern) (Heat Power Engineering)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of scientific calculator is allowed.
- 4) Assume suitable data, if necessary and mention it clearly.

Q1) a) Derive the following governing equation. Comment on the physical principle on which it is based on. [7]

$$\frac{\partial(\rho u)}{\partial t} + \nabla \cdot (\rho u V) = -\frac{\partial p}{\partial x} + \rho f_x$$

b) Derive the conservative form of continuity equation in integral form by simplifying Reynolds Transport equation. Explain the significance of the Reynolds Transport equation. [3]

Q2) a) Consider steady two-dimensional heat transfer in a long solid body whose cross section is given in the figure. The measured temperatures at selected points of the outer surfaces are as shown. The thermal conductivity of the body is $k = 45 \text{ W/m}^\circ\text{C}$, and there is no heat generation. Discuss the solution methodology to determine the temperatures at the indicated points in the medium. Consider the finite difference method and formulate the problem. Take mesh size of $\Delta x = \Delta y = 2.0 \text{ cm}$. [5]

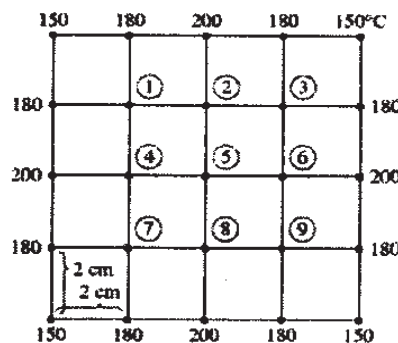


Fig. 1 Computational domain

P.T.O.

- b) Discretize the second order partial differential term with suitable discretization method and show that [5]

$$\frac{\partial^2 u}{\partial x^2} = \frac{2u_i - 5u_{i+1} + 4u_{i+2} + u_{i+3}}{(\Delta x)^2}$$

- Q3)** a) Explain among structured and unstructured grid generation which method is preferred in industry. Justify the comment. Explain in detail advancing front grid generation. [5]
- b) Enlist the different types of physical boundary conditions. Explain in detail any four boundary conditions with neat schematic. [5]

- Q4)** Write the Euler equation in generic conservation form and explain each term. Discretize following equations [10]

$$\frac{\partial u}{\partial t} = c \frac{\partial u}{\partial x} = 0$$

Using

- a) MacCormack scheme
- b) Lax-wendroff scheme and
- c) Upwind scheme
- Q5)** a) What are the different convergence acceleration techniques? Write in detail the multigrid methods. [5]
- b) Simplify the two dimensional Navier Stokes equations in differential form using Stokes assumptions to convert shear stress term into velocity components and viscosity terms i.e. dynamics viscosity (μ) and second viscosity (λ). [5]
- Q6)** a) Write in detail the necessity of the turbulence modeling. Explain Reynolds average Navier Stokes (RANS) model in detail. [5]
- b) Classify turbulence modeling. Explain k - ω turbulent model. [5]

- Q7)** a) Write a grid generation method in any suitable commercial software. What are the important criteria considered for grid generation? Explain how grid quality affects the CFD solution. **[5]**
- b) Explain how CFD analysis will contribute in the context of following examples **[5]**
- i) Hot air recirculation in industrial furnace
 - ii) Electronic cooling



Total No. of Questions : 7]

SEAT No. :

P3920

[5155]-171

[Total No. of Pages : 3

M.E. (Mechanical - Heat Power)
DESIGN OF HEAT TRANSFER EQUIPMENTS
(2013 Course) (Semester -III) (602114)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

Q1) a) What are the different steps considered in heat exchanger design. **[5]**

b) Explain in detail the Kerns Method for heat exchanger design. **[5]**

Q2) a) In a counter flow double pipe heat exchanger; water is heated from 25°C to 65°C by oil with a specific heat 1.45 kJ/kg K and mass flow rate of 0.9 kg/s. The oil is cooled from 230 °C to 60 °C. If the overall heat transfer coefficient is 420 W/m² K, calculate: **[5]**

i) Rate of heat transfer

ii) The mass flow rate of water and

iii) Surface area of heat exchanger.

b) Draw the temperature distribution in heat exchanger for following configuration. **[5]**

i) Counter flow

ii) Condenser

iii) One shell pass two tube pass

iv) Cross flow with both fluid unmixed

P.T.O.

- Q3) a)** Explain the different losses in the heat exchangers. [5]
- b) Steam enters a counter flow heat exchanger, dry saturated at 10 bar and leaves at 35°C. The mass flow rate of steam is 800 kg/min. The gas enters the heat exchanger at 650°C with a mass flow rate of 1350 kg/min. If the tubes are 30 mm diameter and 3 m long; determine the number of tubes required. Neglect the resistance offered by metallic tubes. Use following data: [5]
- for steam $t_{sat} = 180^{\circ}C, C_{ps} = 2.71 \text{ kJ} / \text{kg}^{\circ}C, h_s = 600 \text{ W} / \text{m}^2^{\circ}C$
- for gas: $C_{pg} = 1 \text{ kJ} / \text{kg}^{\circ}C, h_g = 1 \text{ W} / \text{m}^2^{\circ}C$
- Q4) a)** Explain in detail the experimental method for determination of heat transfer coefficient. [5]
- b) A two pass surface condenser is required to handle the exhaust from the turbine developing 15 MW with specific steam consumption of 5 kg/kWh. The pressure of the steam in the condenser vacuum is 660mm of Hg when barometer reads 760 mm of Hg. The mean velocity of water is 3 m/s, water inlet temperature is 24 °C. The condensate is saturated water and outlet of cooling water is 4 °C less than that of the condenser temperature. The quality of exhaust steam is 0.9 dry. The overall heat transfer coefficient based on the outer area is 4000 W/m² °C. the water tubes are 38.4 mm in outer diameter and 29.6 mm in inner diameter. Calculate: [5]
- mass flow rate of water required.
 - Condenser surface area
 - No of tubes required and Tube length.
- Properties of stem at condenser pressure
- $P_s = 0.133 \text{ bar}, t_{sat} = 51^{\circ}C, h_{fg} = 2592 \text{ kJ} / \text{kg},$
- Q5) a)** Enlist the different types of cooling towers used in industrial applications. Explain anyone in detail. [5]
- b) How the thermal performance is tested for the cooling tower. [5]

Q6) a) What are the different parameters considered for furnaces design. [5]

b) The furnace is required to be designed for the bakery application give the detailed methodology for designing of the furnace. [5]

Q7) Write a short note on (Any Three): [10]

a) Use of nano particles in heat transfer equipments.

b) Thermal insulating material.

c) Heat transfer augmentation techniques.

d) Steam trap.



Total No. of Questions : 7]

SEAT No. :

P3921

[5155]-172

[Total No. of Pages :2

**M.E.(Mechanical-Automotive Engineering)
AUTOMOTIVE ENGINE DESIGN
(2013 Pattern) (Semester-I) (502302)**

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1) a)** A diesel engine working on Diesel cycle takes air at pressure of 1 bar & temperature 30°C. The pressure at the end of compression is 30 bar & cut off is 6% of stroke. Calculate **[6]**
- i) Compression ratio
 - ii) The percentage clearance.
 - iii) The heat supplied
 - iv) Heat rejected.
 - v) Thermal efficiency
 - vi) Mean effective pressure.
- b) Give in brief timeline development of CI engine. **[4]**
- Q2) a)** Discuss knock rating of SI & CI fuels. **[4]**
- b) What are the different factors considered for design of combustion chamber in CI engine. **[4]**
- c) Write note on alternate fuels. **[2]**

P.T.O.

- Q3)** a) What are different emissions from diesel engine. Discuss HC emission mechanism in diesel engine. [5]
b) Discuss the various types of catalytic converters used in SI engine. [5]
- Q4)** a) Explain balancing of primary & secondary forces due to reciprocating parts in IC engine. [6]
b) What are methods to reduce torsional vibrations in crankshaft. [4]
- Q5)** Explain in detail-design procedure of crankshaft of engine. [10]
- Q6)** Explain the process design of lubricating system & importance of selection of lubricant. [10]
- Q7)** Write short note on any two: [10]
a) Effect of valve timing on engine performance .
b) Emission Norms.
c) Turbocharger Design.



Total No. of Questions : 7]

SEAT No :

P 3922

[5155]-173

[Total No. of Pages :2

M.E. (Mechanical - Automotive Engineering)
AUTOMOTIVE SAFETY AND REGULATIONS
(2013 Course) (502303) (Semester-I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Describe evolution Roll of Safety systems used in modern automobiles. Explain with example active and passive safety system. **[5]**
- b) Explain with suitable sketch pedestrain body parts injured in road traffic injuries in context of Fatal and Non fatal injuries. **[5]**
- Q2)** a) How crashworthiness evaluation is carried out? What are various tests involves in it? Explain. **[5]**
- b) Describe FMVSS with suitable example. **[5]**
- Q3)** a) Describe procedure for determining the “H” point and the torso angle for adult male in seating position of motor vehicle. **[5]**
- b) What do you mean by determination of injury in case of accidents? What are various criteria of it? Explain. **[5]**
- Q4)** a) Explain the ergonomic concept with suitable example in case of automobile for **[5]**
- i) Design for extremes.
 - ii) Design for average.
 - iii) Design for adjustable range.
- b) Discuss in brief various steps involved in ergonomic design of driver cabin using anthropometric data. Justify your answer with suitable example. **[5]**

P.T.O.

- Q5)** a) What are different types of car seats? How do they compare with each other? Sketch construction of automobile seat and explain its adjusting mechanisms. [5]
- b) What is role of seatbelt in safety systems? Describe with neat sketch types of seat belt assemblies used in vehicles. [5]
- Q6)** a) Explain the procedure and forms required for registration of new vehicle as per CMVR 1989. [5]
- b) Name different types of driving licenses. What restrictions are imposed on a learner's driving license? Discuss in detail steps involved to get permanent license of motor vehicle. [5]
- Q7)** Write Short note on the following (Any Two). [10]
- a) Head lamp construction.
- b) Crash test dummies.
- c) Automobile vehicle types and terminologies.
- d) Crumple Zone.



Total No. of Questions : 7]

SEAT No :

P3923

[5155]-174

[Total No. of Pages : 2

**M.E. (Mechanical Automotive Engineering)
ENGINE COMBUSTION TECHNOLOGY
(2013 Course) (Semester-II) (502307)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of scientific calculator is allowed.*
- 5) *Assume suitable data , if necessary.*

- Q1)** a) C_8H_{18} fuel is burnt with 20% excess air and combustion is complete. Estimate volumetric composition of products of combustion including water vapour formed. **[6]**
- b) Explain 1st law analysis of reacting system. **[4]**
- Q2)** a) Methane (CH_4) is burned with 20% excess air during combustion process. Assuming complete combustion determine air fuel ratio fuel air ratio actual and fuel air ratio stiochiometric, equivalence ratio and write combustion equation. **[5]**
- b) Explain laminar flame propagation in engine. **[5]**
- Q3)** a) Explain the concept of combustion quality **[5]**
- b) What are F head combustion chambers? Discuss two important F head designs. **[5]**
- Q4)** a) Explain the concept of detonation in SI engine. **[5]**
- b) What are the various methods to generate swirl in CI engine. **[5]**
- Q5)** a) Explain stratified charge combustion. **[5]**
- b) Explain EGR method for control of emission. **[5]**

P.T.O.

Q6) a) What are the requirements of combustion chamber in gas turbine. [5]

b) Describe briefly factors affecting combustion chamber performance in gas turbine [5]

Q7) Write short notes on (Anyt two). [10]

a) Flame tube cooling.

b) Adiabatic flame temperature.

c) Swirl measurement.



Total No. of Questions : 5]

SEAT No :

P 3924

[5155]-175

[Total No. of Pages :2

M.E. (Mech. - Automotive)
NOISE VIBRATION AND HARSHNESS
(2013 Course) (Semester-II) (502308)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer all questions.*
- 2) Neat diagrams must be drawn whenever necessary.*
- 3) Figure to the right indicates full marks.*
- 4) Use of electronic pocket calculator is allowed.*
- 5) Assume suitable data if necessary.*

Q1) Solve any Two questions.

- a) What are the Interior sources of noise in vehicle? **[5]**
- b) Explain propagation of sound, reflection of sound, absorption of sound and refraction of sound? **[5]**
- c) The sound pressure level measured at 10 m from an automobile horn is 110 dB. Determine the sound pressure level at distance of i) 20 m ii) 80 m. Assume that the inverse square law holds good between intensity and distance. **[5]**

Q2) Solve any Two questions.

- a) Explain the working of sound intensity probe P-P. **[5]**
- b) What are the different methods of noise source identification available? **[5]**
- c) Explain Sound power level and sound intensity level. **[5]**

P.T.O.

Q3) Solve any Two questions.

- a) Explain the single source structure-borne noise transmission path analysis. [5]
- b) Explain effect of noise on human beings. [5]
- c) Two machines are working in noisy environments. The background noise when the machines are inoperative is 65 dB. If the two machines having individual sound pressure levels of 84 and 88 dB are switched on simultaneously, determine the combined sound pressure level of the machines along with the background noise. [5]

Q4) Solve any Two questions.

- a) What are the different types of sound Absorbers are used? [5]
- b) Explain the working of reactive type silencer. [5]
- c) Explain Impedance tube (Kundt's tube) method (ASTM E 1050) using two microphones for evaluating sound absorption coefficient. [5]

Q5) Write a Short Note (Any two).

- a) Sound insulation [5]
- b) Digital Signal Processing [5]
- c) Pass by Noise measurement of Vehicle [5]



Total No. of Questions : 7]

SEAT No. :

P3925

[5155]- 176

[Total No. of Pages : 2

M.E. (Mechanical) (Automotive Engineering)
AUTOMOTIVE CHASSIS DESIGN
(2013 Pattern) (Semester - II) (502309)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide rule and electronic pocket calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Describe with the help of sketches, working of independent wheel suspension system of a modern car dealing with high acceleration, peak speed and high cornering speed. **[5]**

b) A helical compression spring is to be designed to absorb the shocks. The initial compression of spring is 35 mm and it is further compressed by 50 mm while absorbing the shocks the spring is to absorb 220 J of energy during the process. The spring index can be taken as 7. The spring is made of patented and cold drawn steel wire with an ultimate tensile strength of 1300 N/mm² and modulus of rigidity of 81370 N/mm². The permissible shear stress for the spring wire should be taken as 25% of ultimate tensile strength. Calculate **[5]**

- i) Spring stiffness
- ii) Wire diameter
- iii) Mean coil diameter
- iv) Number of active turns.

Q2) a) Explain the function and working of steering gear box mechanism with neat sketch. Name its components. **[5]**

b) Write short note on Steering characteristics. **[5]**

P.T.O.

- Q3)** a) With the help of neat diagram explain the working and construction of disc brake. [5]
- b) Explain with the help of neat sketch Bendix Hydrovac vacuum brake system. [5]
- Q4)** a) Draw cross section of a tyre explaining the role of various components. What are the factors improving road grip? [5]
- b) Write short note on Retrading and manufacturing of tyres. [5]
- Q5)** a) With the help of neat sketch explain working of six wheeled vehicle. Discuss its application and the method of calculating wheel torque on different wheels. [5]
- b) Write short notes on Scammell articulated trailer. [5]
- Q6)** a) Explain different types of brake shoe adjustments. [5]
- b) Write short notes on Wheel alignment. [5]
- Q7)** Write short notes on the following (**Any two**): [10]
- a) Active suspension.
- b) Application of composites in various car components.
- c) Specifications of tyres with respect to sizes, dimensions, ply ratings and markings.



Total No. of Questions : 5]

SEAT No. :

P3926

[5155]-177

[Total No. of Pages : 2

M.E. (Mechanical) (Automotive Engineering)
VEHICLE DYNAMICS
(2013 Pattern) (Semester - III) (602313)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt ALL questions.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) Attempt any two.

- a) Sketch the tire axis system and explain in brief. **[5]**
- b) Explain variation of tractive effort with longitudinal slip. **[5]**
- c) Describe characterization of cornering behavior of tires. **[5]**

Q2) Attempt any two.

- a) Write short note on Gradability. **[5]**
- b) Explain aerodynamic forces and moments. **[5]**
- c) Explain Electronic Brake assist System. **[5]**

Q3) Attempt any two.

- a) Explain steering force and moments in suspension kinematics. **[5]**
- b) Determine the geometry that would be necessary to achieve 100% anti-squat in the rear suspension and geometry to achieve full anti pitch for the solid axle, rear wheel drive vehicle described below. Also find the pitch rate when the geometry is set for 100% anti-squat in rear suspension the front and rear suspension spring rates are 265 and 169 lb/in respectively. The CG height is 18 inches and wheel base is 109. **[5]**
- c) Describe the roll center analysis. **[5]**

Q4) Attempt any two.

- a) Compare the curvature response of neutral steer, understeer and Oversteer vehicles. **[5]**

P.T.O.

- b) Explain the steady-state handling characteristics of a two-axle vehicle. [5]
- c) Explain the handling behavior of car without vehicle stability control system. [5]

Q5) Attempt any two.

- a) Write short notes on modelling of springs. [5]
- b) Write short notes on Two degrees of freedom vehicle model for pitch and bounce. [5]
- c) Explain the effect of wheel base in road and suspension modelling [5]



Total No. of Questions : 8]

SEAT No. :

P3927

[5155]-178

[Total No. of Pages :1

M.E. (Mechanical) (Automotive Engineering)
AUTOTRONICS
(2013 Pattern) (Semester-III) (602314)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

- Q1)** Explain Vehicle communication Networks. **[10]**
- Q2)** a) Define Analog and Digital signal. Explain Analog to Digital conversion. **[5]**
b) Explain the logic probe and its applications in Diagnostic tests. **[5]**
- Q3)** a) Explain sensors used in Antilock breaking systems. **[5]**
b) Explain scroll compressors used in automobile air conditioning. **[5]**
- Q4)** Explain computerized Engine control system. **[10]**
- Q5)** a) Discuss in brief the emission control system. **[5]**
b) Write a short note on V to I Converter using Op-Amps. **[5]**
- Q6)** a) Discuss with block diagram fuel injection system in general. **[5]**
b) Explain active head rests. **[5]**
- Q7)** a) Explain thermostatic expansion valve in automobile air conditioning system. **[5]**
b) Explain the concept of diagnostic trouble codes and types of faults. **[5]**
- Q8)** Explain automatic temperature control w.r.t. its operation and sensors used. **[10]**

Total No. of Questions :5]

SEAT No. :

P3928

[5155]-179

[Total No. of Pages :2

**M.E.(Mechanical) (CADME)
ADVANCED MACHINE DESIGN
(2013 Pattern) (Semester-I) (502402)**

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

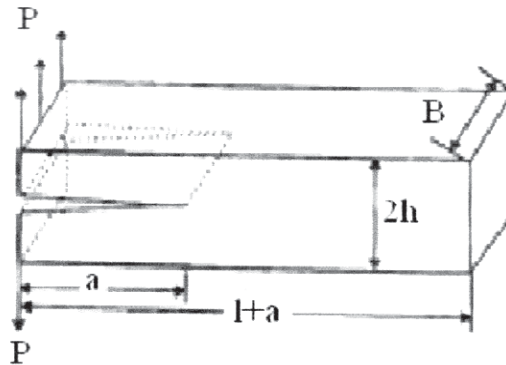
- 1) *Attempt ALL questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *Assume suitable data, if necessary.*

Q1) Attempt any TWO:

- a) Explain in brief the state of strain at a point. [5]
- b) Explain the maximum elastic strain theory. [5]
- c) Derive the expression for Airy's stress function in rectangular coordinate. [5]

Q2) Attempt any TWO:

- a) Explain theory of virtual work and energy. [5]
- b) Explain the concept of energy balance during crack growth. [5]
- c) Determine strain energy release rate for a double cantilever beam with $a \gg 2h$ and $l \gg 2h$ as shown in figure. The P is a applied load and B is the width of beam. [5]



P.T.O.

Q3) Attempt any TWO:

- a) Explain Low cycle and High cycle fatigue. [5]
- b) Discuss the loading and deflection of rubber springs used for simple shear load. [5]
- c) Describe Transverse shear effect in composite laminates. [5]

Q4) Attempt any TWO:

- a) Following creep data at a certain temperature is known. [5]

$$S_1 = 12.5 \text{ MPa} \quad \dot{\epsilon}_1 = 0.015 \text{ percent per 1000 hrs}$$

$$S_2 = 15 \text{ MPa} \quad \dot{\epsilon}_2 = 0.02 \text{ percent per 1000 hrs}$$

Determine the constants of hyperbolic sine law and calculate the creep rates of stress 26 MPa and 29 MPa.

- b) Explain in brief significance of interference and undercutting. [5]
- c) Derive the expression for estimated time of rupture. [5]

Q5) Attempt any TWO:

- 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 [5]
 - ii) Blank diameter and depth of cutter setting
 - iii) Actual pressure angle.

Take usual notations.

$$\theta = \text{inv} \phi$$

$$\phi = v - \frac{2}{15}v^3 + \frac{3}{175}v^5 \text{ Where } v = \sqrt[3]{3\theta}$$

θ and ϕ are in radians.

- b) List out and explain any one Fatigue strength improvement techniques. [5]
- c) Explain octahedral shear stress theory. [5]



Total No. of Questions : 8]

SEAT No. :

P3929

[5155]- 180

[Total No. of Pages : 2

**M.E. (Mechanical) (C. A. D. M. E.)
COMPUTERAIDED DESIGN
(2013 Pattern) (Semester - I) (502403)**

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of non programmable calculator is allowed.*
- 4) *Assume Suitable data, if necessary.*

Q1) a) Explain the CAD / CAM system evaluation criteria in brief. **[5]**

b) Discuss with neat sketches explain wire frame entities. **[5]**

Q2) a) Explain the properties of the Bezier curves. **[5]**

b) Discuss the surface representation used in surface modelling. **[5]**

Q3) Explain the Parametric representation of plane surface with neat sketch and explain its need and applications **[10]**

Q4) Explain the surface manipulations used in surface modeling - Displaying, Segmentation, Trimming, Intersection. **[10]**

Q5) a) An entity is rotated about the three principal axes of in MCS with equal angles of 45° each. Find the equivalent axis and angle of rotation. **[6]**

b) Write notes on mass property calculations. **[4]**

Q6) Explain data representation techniques used in Boundary Representation (B-rep) models. **[10]**

P.T.O.

- Q7)** a) Explain Step Architecture with the help of neat block diagram. [5]
b) Explain features based modeling techniques and state major advantage of features based modeling over other. [5]
- Q8)** a) Explain the tolerance modeling concepts used in CAD. [5]
b) Explain, how collaborative product design enhances the productivity. [5]



Total No. of Questions : 7]

SEAT No. :

P3930

[5155]-181

[Total No. of Pages :1

**M.E.(Mechanical) (CADM & E)
COMPUTER INTEGRATED MANUFACTURING
(2013 Pattern) (Semester-II) (502407)**

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Attempt any FIVE questions from following.*
- 2) Figures to the right indicate full marks.*

Q1) Explain Group Technology and compare with Manufacturing Cell. **[10]**

Q2) Discuss database models used in CIM. **[10]**

Q3) Explain role of machining centers, inspection equipment and material handling equipment in Flexible Manufacturing System. **[10]**

Q4) Explain Process Management and Control through Web. **[10]**

Q5) Explain any three tools used for effective implementation of Lean Manufacturing. **[10]**

Q6) Explain Networking in a Manufacturing Organisation for implementation of CIM. **[10]**

Q7) Elaborate:

- a) Value of the Product **[5]**
- b) The Supply Chain **[5]**



Total No. of Questions :7]

SEAT No. :

[Total No. of Pages :1

P3931

[5155] - 182

M.E. (Mechanical Engineering) (CADME)
INDUSTRIAL PRODUCT DESIGN & PRODUCT LIFE CYCLE
MANAGEMENT
(2013 Credit Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Answer any five questions from the following.*
- 2) Neat diagrams must be drawn whenever necessary.*
- 3) Figures to right indicates full marks.*
- 4) Assume suitable data if necessary.*

- Q1)* What is S-curve technology? Give its advantages & Disadvantages. [10]
- Q2)* Discuss C-sketch method in detail with example. [10]
- Q3)* Discuss product teardown process with example. [10]
- Q4)* Explain the use transition of CAD, EDM to PDM in product life cycle management. [10]
- Q5)* Explain PLM system architecture in detail. [10]
- Q6)* What are the components of PDM system? Explain? [10]
- Q7)* Discuss the factors affecting the implementation of PDM system. [10]

EEE

Total No. of Questions : 7]

SEAT No. :

P3932

[5155]-183

[Total No. of Pages :2

M.E. (Mechanical) (C.A.D.M.E.)

AUTOMATED MANUFACTURING SYSTEM MODELING

(2013 Pattern) (Semester - II) (502409)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any 5-questions.*
- 2) *Draw neat sketch if required.*
- 3) *Use of calculator is allowed.*
- 4) *Assume suitable data if required.*

- Q1)** a) Explain the terms i] Flexibility ii] Performability iii] Reliability iv] Availability. [5]
- b) A CNC machine is to cut 2000 parts with cycle time of 15min. calculate no of Machines given with 70hrs availability. The utilization of m/c is 100% calculate shift hour during the period? [5]
- Q2)** a) Explain Types of Automated inspection systems and also elements of CMM with sketch? [5]
- b) AGV has Delivery distance and return distances as 1000mm and 1200mm with Velocity of 100mm/sec and the load unload handling time of 20min with traffic factor 0.7 and about 10 deliveries are to be made per hour. Then calculate i] Total delivery time ii] Number of delivery per hr/per vehicle iii] Number of AGVs? [5]
- Q3)** a) Explain infinite and finite Birth and Death process in manufacturing? [5]
- b) Explain explain computational issues in i] Steady state and ii] Transient markov analysis? [5]
- Q4)** a) Explain M/M/m queue model with state diagram? [4]
- b) A CNC machine center process raw parts one at time in M/M/1 fashion.
- let $\lambda = 20$ parts /h and $\mu = 15$ parts /h then let $\rho < 1$ so calculate following i] Machine utilization ii] Mean no of customers in system iii] Mean no of customers in queue iv] Mean waiting time in system and v] Mean waiting time in queue? [6]

P.T.O.

- Q5)** a) Explain and sketch a Horizontal machining Centre with indexing table?[5]
b) Explain open and closed queuing network with sketch? [5]
- Q6)** a) List characteristics of non-product form features of AMS? [5]
b) Explain Reliability and availability measures in AMS ? [5]
- Q7)** a) Explain petrinet primitives with sketch ? And also any-3 applications of petrinets in AMS ? [5]
b) Explain and sketch GSPN Model for 3-stage Kanban System? [5]



Total No. of Questions : 7]

SEAT No. :

P3933

[5155]-184

[Total No. of Pages :1

M.E. (Mechanical)

(Computer Aided Design, Manufacturing & Engineering)

SIMULATION MODELING

(2013 Pattern) (Semester - III) (602413)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any FIVE questions from the following.*
- 2) *Figures to the right side indicate full marks.*

Q1) Define System and Environment? Discuss Discrete and continuous System Simulation. **[10]**

Q2) Explain Mid Square Method and Mid Product Method for Random Number Generation. **[10]**

Q3) Represent stages in model building with neat flow diagram. Explain verification and validation in model building. **[10]**

Q4) Explain Kolmogorov Smirnov test and the Chi Square test for simulation in detail. **[10]**

Q5) Explain usefulness of any two simulation packages with their capabilities in simulation modeling. **[10]**

Q6) With suitable engineering example describe single channel queue and two server queue. **[10]**

Q7) How measures of performance are estimated? Explain output analysis for terminating simulation for Machining Centre. **[10]**



Total No. of Questions : 7]

SEAT No. :

P4916

[Total No. of Pages : 2

[5155]-185

M.E. (Mechanical) (CADM & E) (Semester - III)

OPTIMIZATION TECHNIQUES

(2013 Pattern)

Time : 2.30 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions from the following.*
- 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.*

Q1) Maximize : $f = x_1 + 2x_2 + x_3$ **[10]**

Subject to $2x_1 + x_2 - x_3 \leq 2$

$$-2x_1 + x_2 - 5x_3 \geq -6$$

$$4x_1 + x_2 + x_3 \leq 6$$

$$x_i \geq 0, i = 1,2,3 \text{ using Simplex Method.}$$

Q2) How optimization problem can be formed & Discuss classification of optimization problem. **[10]**

Q3) Solve $X^2 + 54/x$ by successive quadratic interpolation method. **[10]**

Q4) Explain secant method. **[10]**

P.T.O.

Q5) Minimize $F(X_1, X_2) = [X_1^2 + X_2 - 11]^2 + [X_1 + X_2^2 - 7]^2$

Subjected to

$$g_1(x) = 26 - (X_1 - 5)^2 - X_2^2 \geq 0,$$

$$g_2(x) = 20 - 4X_1 - X_2 \geq 0,$$

$$5 \geq X_1, X_2 \geq 0$$

Using complex Search Method, [10]

Q6) Discuss in brief simulated annealing & Particle Swarm Optimization [10]

Q7) Explain the working variable elimination method & cubic search method particle Swarm Optimization. [10]



Total No. of Questions : 8]

SEAT No :

P3934

[5155]-186

[Total No. of Pages :2

**M.E. (Mechanical-Energy Engineering)
ADVANCED THERMODYNAMICS
(2013 Course) (Semester-I)**

Time : 3 Hours

Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) How real gas behavior is analysed? State the assumptions for an ideal gas behavior. [5]
b) Discuss the generalised compressibility chart with suitable diagram? [5]
- 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. [4]
b) For boiler at 8 kg/cm² (g) steam pressure. The following details are given. [6]
Saturation temperature of steam = 170°C
Sensible heat of water = 720 kJ/kg
Latent heat of evaporation = 2058 kCal/kg
Moisture content in the steam = 4%
What is the total heat content of the steam?
- Q3)** a) Explain increase in Exergy Destruction. [5]
b) Discuss the Law of degradation of energy and availability function of closed and open system. [5]
- Q4)** Write a note on
a) T-dS relations. [5]
b) Thermo electricity and Onsager equation. [5]

P.T.O.

Q5) a) Explain Inversion Curve and Joule-Thompson coefficient. [5]

b) Derive the relation $(C_p - C_v) = -T \left(\frac{\partial v}{\partial T} \right)_p^2 \left(\frac{\partial p}{\partial v} \right)_T$ [5]

Q6) a) Explain the criteria for chemical equilibrium. [4]

b) The following are the ultimate analysis for coal: Calculate the stoichiometric air requirement. [6]

Carbon-38%, Ash-35%, Hydrogen-5%, Sulphur-2%

For the same data, calculate the theoretical CO_2

If the actual measured CO_2 is 8%, find out the excess air levels?

Q7) a) Discuss the Amagat's Law and Kay's Rule. [5]

b) As applied to statistical thermodynamics, explain the principle of equipartition of energy. [5]

Q8) Write a note on

a) Fugacity and activity of a species in a mixture. [5]

b) Clapeyron equation. [5]



Total No. of Questions : 8]

SEAT No. :

P3935

[5155]-187

[Total No. of Pages : 3

**M.E.(Mechanical-Energy Engineering)
ADVANCED HEAT TRANSFER
(2013 Pattern) (Semester-II) (502107)**

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

Q1) a) A reactors wall, 320 mm thick, is made up of an inner layer of fire brick($k=0.84 \text{ W/m}^\circ\text{C}$) covered with a layer of insulation ($k=0.16 \text{ W/m}^\circ\text{C}$). The reactor operates at a temperature of 1325°C and the ambient temperature is 25°C . **[6]**

- i) Determine the thickness of fire brick and insulation which gives minimum heat loss.
- ii) Calculate the heat loss presuming that the insulating material has a maximum temperature of 1200°C .

b) Draw velocity boundary layer and thermal bondary layer for flow through tubes and flow over plate. **[4]**

Q2) a) Derive an expression for generalized three dimensional heat conduction equation in Cylindrical Coordinates for unsteady flow. **[7]**

b) Explain the significance of Nusselt Number. **[3]**

Q3) a) What are Fourier and Biot Numbers? What is the physical significance of these numbers? **[5]**

b) What are Heisler charts? Explain its significance in solving transient conduction problems? **[5]**

P.T.O.

Q4) a) Using dimensional analysis establish a relation between Nusselt, Prandtl and Grashof numbers. [6]

b) Explain Chilton-Colburn analogy. [4]

Q5) A horizontal tubular 1-1 condenser is used to condense saturated steam at 80°C. The condenser is a shell and tube one with brass tubes ($k=110\text{W/m}^\circ\text{C}$) of 1.59 cm OD and 1.34 cm ID. Steam is outside tubes and cooling water enters the tubes at 20°C with a velocity of 1.4 m/s and leaves at 40°C. If the rate of cooling water supply is 55000 kg/h and the latent heat of condensation of steam at 80°C is 2304 kJ/kg, Calculate [10]

a) The number of tubes

b) The length of each pipe

For calculating the tube side heat transfer coefficient use the Dittus-Boelter equation and for the shell side heat transfer coefficient, the average value may be taken as $10760\text{W/m}^2\text{K}$.

Data—Properties of water at 30°C— $k=0.659\text{ W/mK}$ $\rho=979.8\text{ kg/m}^3$ $C_p=4.180\text{ kJ/kg K}$ $\mu = 0.4044\times 10^{-3}$.

Q6) a) Write a note on Combined Convection. [5]

b) Air stream at 24°C is flowing at 0.4 m/s across a 100W bulb at a 130°C. If the bulb is approximated by a 65mm diameter sphere, calculate: [5]

i) The heat transfer rate and

ii) The percentage of power lost due to convection.

Use correlation $Nu = 0.37 (Re)^{0.6}$

Properties of air at 77°C $k = 0.03\text{ W/m}^\circ\text{C}$

$$\nu = 2.08\times 10^{-5}\text{ m}^2/\text{s}$$

$$Pr = 0.697$$

Q7) A hot plate $1\text{ m} \times 0.5\text{ m}$ at 130°C is kept vertically in still air at 20°C . Find **[10]**

- a) Heat transfer coefficient
- b) Initial rate of cooling the plate in $^\circ\text{C}/\text{min}$
- c) Time required for cooling plate from 180°C if the heat transfer is due to convection only. Mass of plate is 20 kg and $C_p = 400\text{ J/kgK}$. Assume 0.5 m side is vertical and that the heat transfer coefficient calculated in
 - i) above remains constant and convection takes place from both sides of the plate.

Use correlation $Nu_L = 0.59(\text{Gr.Pr.})^{1/4}$ for $(10^4 < \text{Gr.Pr.} < 10^9)$

Take properties of air at 75°C $C_p = 1007\text{ J/kgK}$,

$$\rho = 1.07\text{ Kg/m}^3$$

$$k = 0.029\text{ W/m}^\circ\text{C}$$

$$\nu = 19.1 \times 10^{-6}\text{ m}^2/\text{s}.$$

Q8) A metal plate 0.609 m in height forms the vertical wall of an oven and is at a temperature of 171°C . Within the oven is air at a temperature of 93.4°C and atmospheric pressure. Assuming that natural convection conditions hold near the plate and that this case **[10]**

$$Nu = 0.548(\text{Gr.Pr.})^{1/4}$$

Find the mean heat transfer coefficient and the heat taken up by air per second per meter width. For air at 132.2°C , take $k = 33.2 \times 10^{-6}\text{ kW/mK}$, $\mu = 0.232 \times 10^{-4}\text{ kg/ms}$, $C_p = 1.005\text{ kJ/kgK}$. Assume air as an ideal gas and $R = 0.287\text{ kJ/kgK}$.



Total No. of Questions : 8]

SEAT No :

P 3936

[5155]-188

[Total No. of Pages :2

**M.E. (Mechanical - Energy Engineering)
ENERGY CONVERSION SYSTEMS
(2013 Course) (Semester-II) (502508)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculators is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) Explain the sources of energy and their scenario with peculiar characteristics. **[6]**

b) Write a short note on conversion of energy from Hydrogen. **[4]**

Q2) A gas turbine set draws in atmospheric air at 1 bar and 15°C. There are two pressure stages with perfect intercooler and the total pressure ratio is 25:1. The maximum temperature of the cycle is 1300°C and there is one turbine for expansion a regenerator is used and recovers 70% of the available heat. Determine the efficiency of the plant and the ratio of the useful work to turbine work. The turbine and compressor efficiencies may be taken as 0.87 and 0.86 respectively. Assume mechanical efficiency of whole assembly equal to 0.96 and generator efficiency as 0.98. **[10]**

Q3) a) Explain the effect of turbine inlet temperature, pressure ratio and compressor inlet temperature on thermal efficiency of gas turbine power plant. **[4]**

b) Write a note on Combined Gas Turbine Cycles with Heat Recovery Boiler. **[6]**

P.T.O.

- Q4)** a) Explain the indirect method of evaluation for boiler performance. [6]
b) Write a note on De-aeration of boiler feed water. [4]
- Q5)** a) Describe the factors affecting on performance and energy efficiency of refrigeration plants. [5]
b) State the types of Fluidized Bed Combustion Boilers and explain any one with sketch. [5]
- Q6)** a) Explain the factors affecting the selection of cogeneration system. [4]
b) Explain the flow control strategies for fan and blowers. [6]
- Q7)** a) Explain the factors affecting the efficient operation of compressed air system. [6]
b) Explain energy conservation opportunities in pumping system. [4]
- Q8)** a) Explain the criteria for selection of diesel generator system. [5]
b) Explain the factors affecting cooling tower performance. [5]



Total No. of Questions : 8]

SEAT No. :

P3937

[5155]-189

[Total No. of Pages :2

**M.E. (Mechanical-Energy Engineering)
ENERGY MANAGEMENT
(2013 Course) (Semester - II) (502509)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answers any 5 questions.*
- 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.*

Q1) a) What is draft in combustion system? Explain briefly the different types of draft. **[5]**

b) What do you understand by reducing the work to be done by steam? **[5]**

Q2) a) Write a short note on Fuel Feeding system in a AFBC boiler. **[5]**

b) List down the various energy conservation opportunities available in a steam system. **[5]**

Q3) An uninsulated 100 mm pipe of 200m length carries steam at 10 kg/cm². The surface temperature measured is 165°C. Find out the annual cost saving achieved by insulating it with 50 mm. insulating material, which will bring the surface temperature down to 60°C. The boiler efficiency is 85% and the fuel oil (with GCV of 10000 Kcal/kg) cost is Rs.14000/tonne and ambient air temperature is 30°C and ambient temperature is 30°C and annual operating hour is 8000 hours. **[10]**

Q4) a) What is under-loading of motor? What are the four causes for under-loading of motors? Mention the possible measures to overcome the under-loading. **[5]**

b) What are the various losses in motor and briefly explain its causes? **[5]**

P.T.O.

- Q5)** a) Enumerate the advantages of FBC Boilers. [5]
b) How does a plate heat exchanger work? Give typical examples. [5]
- Q6)** a) What are flow control strategies of the fan? [5]
b) Define energy management and objectives of the energy management. [5]
- Q7)** a) What is boiler blow down? [5]
b) Explain heat transfer loops in case of refrigeration system. [5]
- Q8)** a) Explain the classification of radioactive wastes by radioactivity concentration with the help of graph. [5]
b) Write short note on thermal heat wheels. [5]



Total No. of Questions : 8]

SEAT No. :

P3938

[5155]- 190

[Total No. of Pages : 2

M.E. (Mechanical-Energy Engineering)
NUCLEAR MATERIALS AND REACTOR FUNDAMENTALS
(2013 Pattern) (Semester - III)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions from the following.*
- 2) *Neat sketches may be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume Suitable data if necessary, and mention the same.*

- Q1)** a) Describe the following processes: **[6]**
- i) Alpha decay
 - ii) Beta decay
 - iii) Electron capture
 - iv) Isomeric transitions
- b) Describe the Bohr model of an atom. **[4]**
- Q2)** a) What is dislocation theory in regard to nuclear materials? **[3]**
- b) Explain different types of crystal structures with neat sketches. **[7]**
- Q3)** a) Write a note on nuclear fission. **[5]**
- b) Explain neutron interactions. **[5]**
- Q4)** a) Define and explain fast fission factor, thermal utilization factor and effective multiplication factor. **[6]**
- b) Explain gas cooled reactor with schematic diagram. **[4]**

P.T.O.

- Q5)** a) Compare the AVLIS and SILEX method of enrichment of nuclear fuel. [4]
b) Explain nuclear fuel enrichment methods. [6]
- Q6)** a) Explain different cost factors in nuclear fuel cycles. [4]
b) Explain purchase, conversion, Enrichment and reprocessing costs in respect of nuclear fuel management. [6]
- Q7)** a) Plot the radioactive decay curve for nitrogen-16 over a period of 100 seconds. The initial activity is 142 curies and the half-life of nitrogen-16 is 7.13 seconds. Plot the curve on both linear rectangular coordinates and on a semi-log scale. [6]
b) Explain the hardening and embrittlement of nuclear materials due to exposure of nuclear radiations. [4]
- Q8)** Define the following terms: [10]
a) Fissile material
b) Fissionable material
c) Fertile material
d) Reactor period
e) Doubling time



Total No. of Questions : 8]

SEAT No. :

P3939

[5155]-191

[Total No. of Pages :2

M.E. (Mechanical) (Energy Engineering)
ENERGY SYSTEMS MODELING AND ANALYSIS
(2013 Course) (Semester - III) (602514)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of Calculator is allowed.*

Q1) a) Compare discrete system and continuous systems. **[4]**

b) Differentiate between system analysis and system design. **[6]**

Q2) Fit a second order polynomial to the following data; derive required expression using least square method: **[10]**

x	0	0.5	1.0	1.5	2.0	2.5
y	0	0.25	1.0	2.25	4.0	6.25

Q3) What are different types of model explain Mathematical model and Numerical model. **[10]**

Q4) 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. **[10]**

P.T.O.

- Q5) a)** The flow rate $Q(\text{m}^3/\text{s})$ in circular pipes is measured as a function of the diameter D and the pressure difference Δp . Obtain a best fit for data given in table, assuming a power-law dependence of Q on the two independent variables D and Δp . **[6]**

	D(m)	0.3	0.5	1.0	1.4
Δp (atm)					
0.5		0.13	0.43	2.1	4.55
0.9		0.25	0.81	4.0	8.69
1.2		0.34	1.12	5.5	11.92
1.8		0.54	1.74	8.59	18.63

- b) Explain different steps in simulation study. **[4]**

- Q6)** Use the Simplex method to find the maximum value of:

$$z = 3x_1 + 2x_2 + x_3$$

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 $x_3 \geq 0$. **[10]**

- Q7) a)** Minimize the function $f(x) = 0.65 - [0.75/(1 + x^2)] - 0.65x \tan^{-1}(1/x)$; in the interval $[0,3]$ by the Fibonacci method using $n = 6$. Also find reduction ratio. **[5]**

- b) Explain Fibonacci search technique and write its algorithm to find optimum design. **[5]**

- Q8)** For what purpose Lagrange multiplier method is used? Write the proof of Lagrange multiplier method. **[10]**



Total No. of Questions : 7]

SEAT No. :

P3940

[5155]-192

[Total No. of Pages :2

M.E. (Mechanical-Mechatronics)
SYSTEM MODELLING, IDENTIFICATION & SIMULATION
(2013 Pattern) (Semester - I) (502801)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

Q1) a) When compared with the transfer function approach, list the advantages and the disadvantages of the state space modelling approach. **[5]**

b) Draw a flowchart which depicts the operation of a linear Kalman filter. **[5]**

Q2) For the transfer function given below, draw the signal flow diagram. **[10]**

$$\frac{C(s)}{R(s)} = \frac{(s^2 + 1)}{(s^3 + 3s + 1)}$$

Q3) Convert the below state space model into a transfer function. **[10]**

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

$$y = [1 \ 0]x$$

Q4) Using a suitable flow chart explain the process of identification of a ARX model using the Least Square method. **[10]**

P.T.O.

Q5) a) Differentiate between supervised and un-supervised learning. **[5]**

b) List the criterion for selection of fuzzy membership functions. **[5]**

Q6) Draw the flow chart and explain the operation of predictor-corrector type extended Kalman filter. **[10]**

Q7) Identify a straight line model for below dataset. **[10]**

x	1	2	3	4	5	6	7
y	0.5	2.5	2	4	3.5	6	5.5



Total No. of Questions : 7]

SEAT No. :

P3941

[5155]-193

[Total No. of Pages :2

**M.E.(Mechanical-Mechatronics)
CONTROL SYSTEMS - I
(2013 Pattern) (Semester - I) (502802)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

Q1) Discuss, in detail, the advantages and dis-advantages offered by the FSF type pole placement control technique. **[10]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -0.4 & -5 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u \quad \text{Eq.1}$$

$$y = [0 \ 1] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + [0]u$$

- Q2)** a) The open loop state space model of a second order system is given by Eq.1. Convert this model into an equivalent transfer function. **[5]**
- b) For the system in Eq.1, determine the location of the poles, the zeros and comment on the stability of the system. **[5]**

Q3) For the system in Eq.1, determine the controllability and the observability matrix and comment on the system's controllability and observability. **[10]**

- Q4)** a) For the system in Eq.1, using a suitable technique, determine a full state feedback gain, k , such that the desired closed loop system has maximum percentage overshoot of 1.5% and a 5% settling time of 0.75 seconds. **[7]**
- b) For the system in Eq.1, determine the state space model of the closed loop system using the full state feedback gain k from Q4a. **[3]**

P.T.O.

- Q5)** a) Using the Ackerman's method build an observer such that the observer poles are located at 6 times the closed loop poles. Consider the closed loop poles to be of the closed system from Q4 (b). [5]
- b) For the system in Eq.1, determine the A matrix for the compensator using the full state feedback gain k , and the observe gain L from Q-4 (a) and Q-5 (a) respectively. [5]
- Q6)** Explain the design of a command tracking control system using a suitable example. [10]
- Q7)** Draw a block diagram for a control system made up of the plant, the observer and the compensator and define all the variables/ parameters in the block diagram. [10]



Total No. of Questions : 7]

SEAT No. :

P3942

[5155]-194

[Total No. of Pages :2

M.E.(Mechanical-Mechatronics)
SENSORS, TRANSDUCERS & INTERFACING TECHNIQUES
(2013 Credit Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat figures, diagrams wherever necessary.*
- 4) *Use of scientific calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) What is Chauvenet's criterion? With the help of suitable example how it is applied. **[5]**

b) Explain the following terms: **[5]**

- i) Probability distributions
- ii) Confidence interval & level of significance
- iii) Student's t - Distribution.

Q2) a) Explain operation of photo-conductive transducer using neat diagram. State its various applications & explain any one application in brief. **[5]**

b) Discuss different types of counters & frequency measurement techniques with suitable diagram. **[5]**

Q3) a) Explain- **[5]**

- i) Diaphragm & Bellow gage
- ii) Bridgeman gage

b) With the help of neat diagram explain in detail any one application of pressure gages. **[5]**

P.T.O.

- Q4)** a) Explain the laser doppler anemometer using neat schematic diagram. State advantages & drawbacks of LDA. [5]
- b) Explain the basic principle of magnetic flowmeter. What are the types of magnetic flowmeters? Explain any one in brief. [5]
- Q5)** a) With neat diagrams explain series - & parallel - connection of thermocouples. [5]
- b) Explain any one scheme of viscosity measurement. [5]
- Q6)** a) Discuss in detail the three types of resistance strain gages. Explain the scheme for measurement of resistance strain - gage output. [5]
- b) Define & explain following terms- [5]
- i) Stress
 - ii) Rosette strain gauge
 - iii) Temperature compensation.
- Q7)** a) Give the detailed classification of data acquisition system. With the help of neat block diagram. explain the operation of DAS. [5]
- b) Explain the performance parameters of D - to - A converter, while selecting for any one of the following applications- [5]
- i) 4 channel DAS for home security system.
 - ii) Military application.



[5155] - 195

M.E. (Mechanical) (Mechatronics)

PLC PROGRAMMING

(2013 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Answer any five questions.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) Develop ladder program for the following industrial objective. Given START & STOP buttons as NO, Push-to-on momentary switches. LUP and LE are level switches of NO type. The valves VIN & VOUT are on off valves. Figure Q1 shows the details. [10]

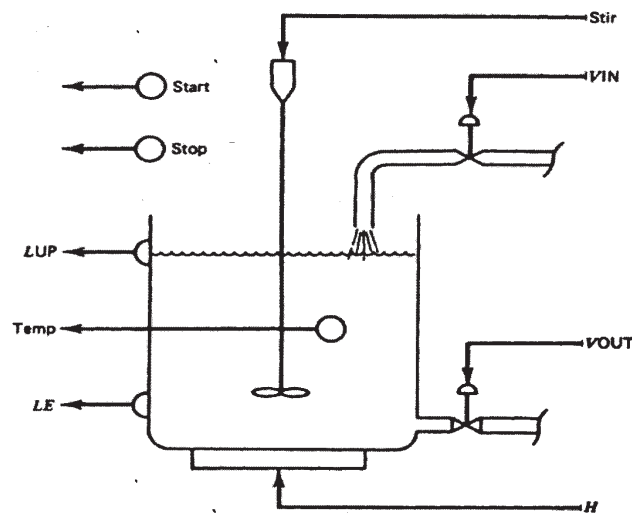


Figure Q1

- a) When START button is pushed the process starts until STOP button is pressed.
- b) The VIN opens when process STARTed and LE is OFF.
- c) When LUP is ON and Temp is OFF, VIN is closed, Stir (Stirrer) is ON, H (Heater) is on.
- d) When Temp is ON, Stir is OFF, H is OFF, VOUT is opened till LE is OFF.

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

P.T.O.

- Q2) a)** Explain on delayed timer with suitable example. [5]
- b) Significance of Boolean algebra in constructing ladder program. Explain with suitable example. [5]
- Q3)** Figure Q3 shows a Digital circuit. Write digital equation, simplify using Boolean algebra and write a ladder rung for this simplified equation. [10]

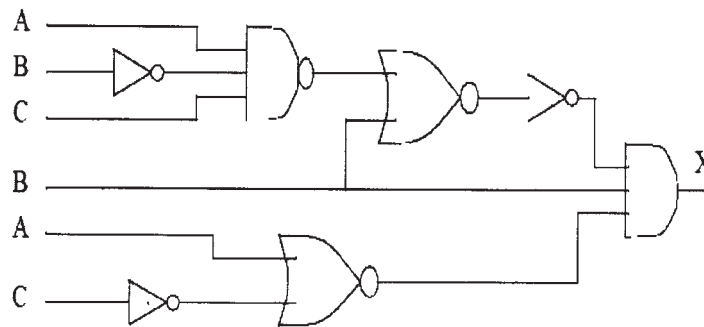


Figure Q 3

- Q4) a)** Explain with one industrial application, Count Up and Count Down Counter Instruction with all status bits. [5]
- b) Explain Jump instructions and subroutines with one example each. [5]
- Q5) a)** Explain timer instruction overview and on delayed timer with suitable example. [5]
- b) Types of switches used in PLC applications with one specific applicaiton thereof. [5]
- Q6) a)** Applications of OFF Delay timers used in ladder progrm with illustrative example. [5]
- b) Compare Function Block Diagrams and Ladder Diagrams. [5]
- Q7) a)** Explain Examine ON and Examine OFF Conditions with two suitable examples of each in the form of ladder diagrams. [6]
- b) Enlist the specifications of discrete I/O Module, analog I/O Modules used in PLC. [4]

Q8) Figure Q8 shows a PLC controlled drilling process. Identify the sequence of conveyor system alone and prepare a list of PLC I/O only. **[10]**

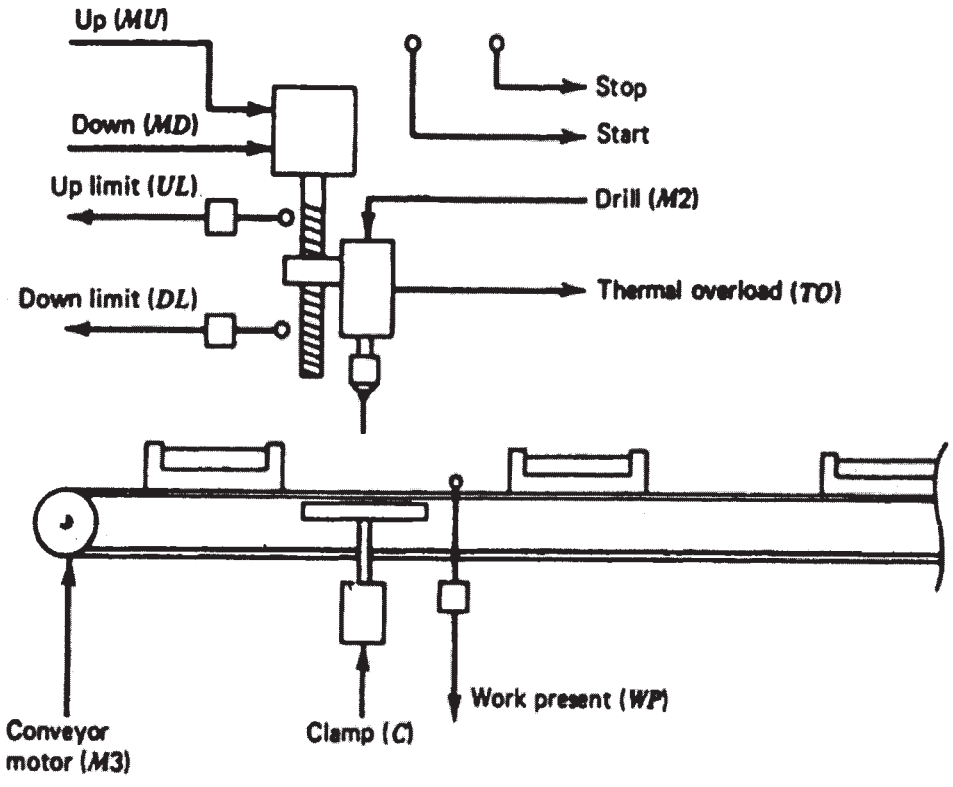


Figure Q 8

EEE

Total No. of Questions : 7]

SEAT No :

P 3944

[5155]-196

[Total No. of Pages :2

M.E.(Mechanical-Mechatronics)
CONTROL SYSTEMS-II
(2013 Course) (Semester-II) (502808)

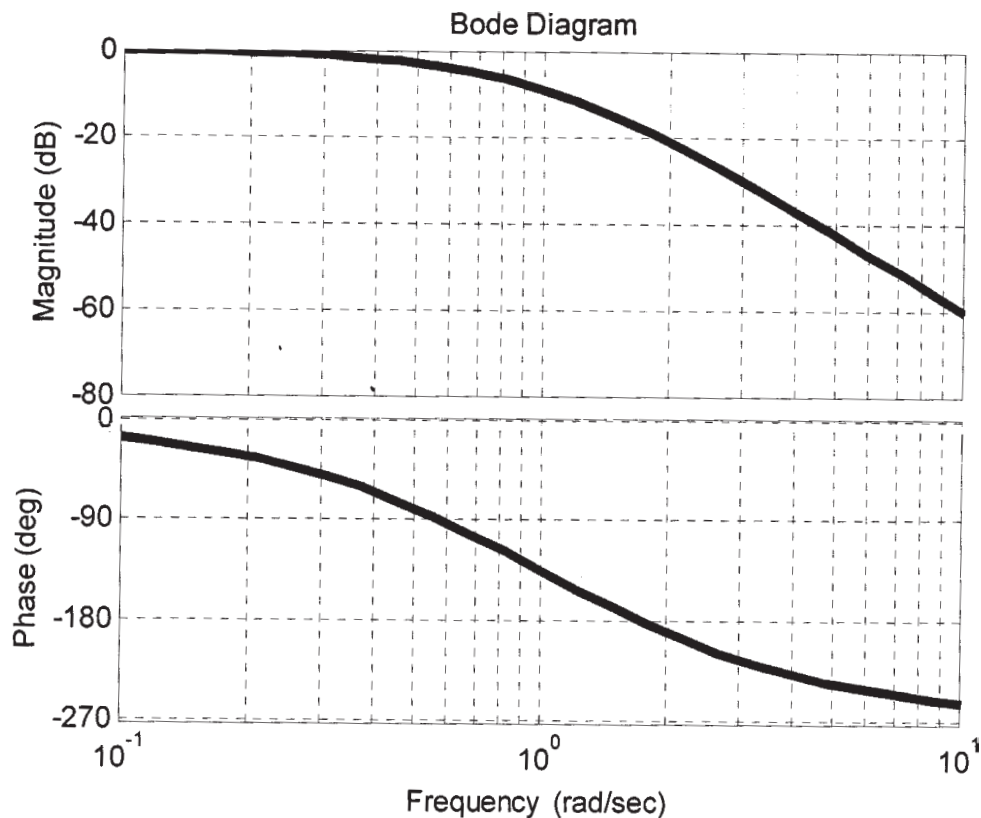
Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

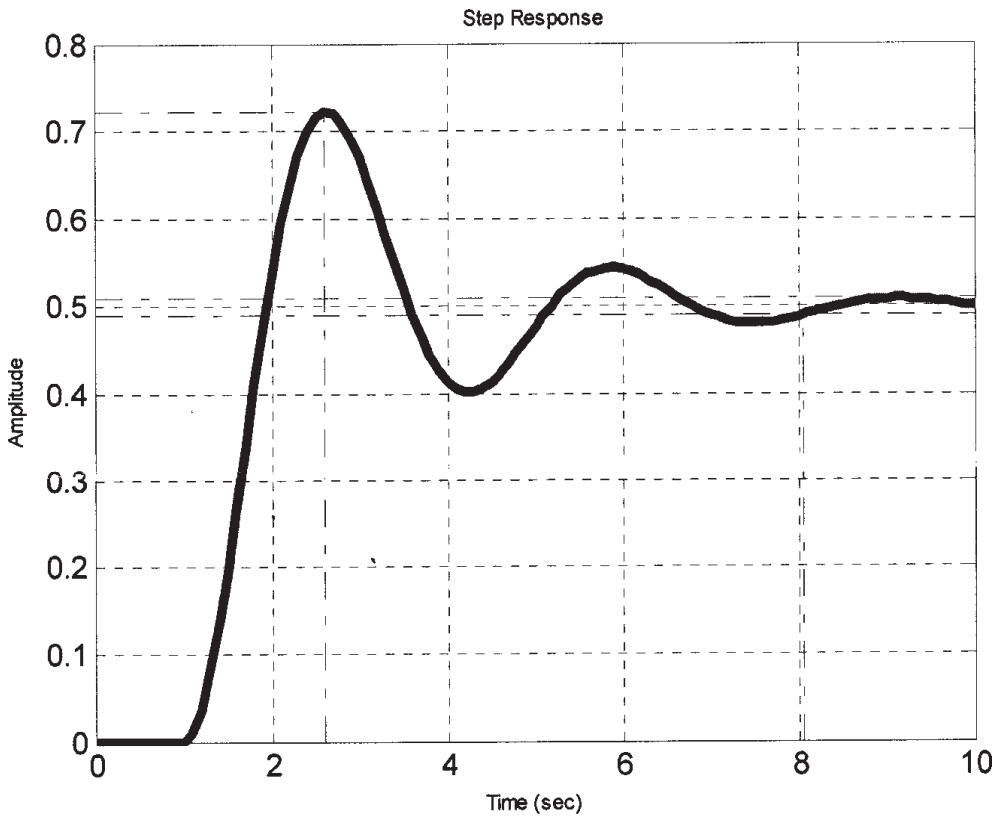
- 1) Answer any five questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculators is allowed.
- 5) Assume Suitable data if necessary.

Q1) The bode plot of a generic system is shown below. Determine the gain and the phase margin and comment on the system stability. [10]



P.T.O.

- Q2)** Using the ZN step response method determine the gains as well as the transfer function of the PID control. Assume $a=0.218$ and $L=0.806$. [10]
- Q3)** Draw a suitable block diagram for a PID controller in series form and discuss the significance of the P, I and the D terms in the controller. [10]
- Q4)** Using a suitable example explain Loop Shaping. [10]
- Q5)** Define Sensitivity and discuss, in detail the relationship between Sensitivity and Gain Margin. [10]
- Q6)** Draw a suitable block diagram and explain the operation of Kappa Tau Controller tuning technique using a suitable example. [10]
- Q7)** The unit step response of a second order system is shown below. Using a suitable technique, identify the model. [10]



Total No. of Questions : 8]

SEAT No. :

P3945

[5155]-197

[Total No. of Pages :2

M.E. (Mechanical) (Mechatronics)
INDUSTRIAL DRIVES AND ACTUATORS
(2013 Pattern) (Semester - II) (502809)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answers any five questions.*
- 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.*

Q1) Explain variable frequency square wave- VSI drive for Three phase Induction motor. **[10]**

Q2) With the help of Trapezoidal waveform explain working of Synchronous motor drive. **[10]**

Q3) a) Compare electro-hydraulics and PLC-hydraulics with respect to cost, significant advantages and disadvantages. **[5]**

b) Discuss in brief with hydraulic circuit symbols, types of hydraulic cylinders and their mountings. **[5]**

Q4) With the help of equivalent circuit explain basic principle of operation of three phase induction motor. **[10]**

Q5) a) With respect to Construction, working and specific applications, discuss vane pump used in industrial hydraulics. **[5]**

b) Draw symbols in hydraulic circuits used to represent sequence valve and pressure compensated pressure relief valve with working. **[5]**

Q6) a) Explain different speed control methods of DC shunt motor. **[6]**

b) Explain Thermal Consideration criteria while selecting electric drive. **[4]**

P.T.O.

Q7) Discuss in brief the counterbalance valve circuit used in industrial hydraulics with the help of hydraulic circuit and components the components used.

[10]

Q8) Answer any two.

[2 × 5 =10]

- a) Multi quadrant operation of an electric drive.
- b) Construction and working of Pressure relief valve.
- c) Active and Passive torque.



Total No. of Questions : 8]

SEAT No. :

P3946

[5155]- 198

[Total No. of Pages : 2

M.E. (Mechatronics) (Mechanical)
MICROCONTROLLER APPLICATIONS IN EMBEDDED SYSTEMS
(2013 Pattern) (Semester - III) (602813)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figure to the right indicate full marks.*
- 4) *Assume Suitable data whenever necessary.*

Q1) a) Explain with neat diagram data memory of PIC18F microcontroller. **[4]**

b) Draw and explain block diagram of PIC 18F microcontroller with MPU and memory. **[4]**

c) Write instructions of PIC 18F microcontroller used for Arithmetic operations. **[2]**

Q2) a) What is assembler? Explain the term directive in an assembler and list out commonly used directives. **[4]**

b) Explain types of data transfer in PIC 18F microcontroller. **[4]**

c) Explain the result after the execution of the following instructions. Identify the status of flags. **[2]**

MOVLW 89H

ADDLW 77H

Q3) a) Explain with Block diagram basic concepts in I/O Interfacing. **[4]**

b) What is subroutine? Explain PIC 18 CALL and RETURN Instructions. **[4]**

c) Explain stack of PIC 18F microcontroller. **[2]**

P.T.O.

- Q4)** a) What are Interrupts? Explain different types of interrupts. [4]
b) Draw and explain with block diagram Timer0 of PIC 18F in 16-bit Mode. [4]
c) List different timers used in PIC 18 F microcontroller. [2]
- Q5)** a) Explain with block diagram Inter-Integrated circuit protocol. [4]
b) Explain D/A conversion in PIC 18F microcontroller. [4]
c) Write different A-to-D conversion methods. [2]
- Q6)** a) Explain all the features of embedded systems. [4]
b) Explain in detail designing of embedded systems. [4]
c) Explain special features of the PIC 18F4520 family. [2]
- Q7)** a) Write a note on Serial Peripheral Interface (SPI) with applications [5]
b) Explain CCP modules of PIC 18 Microcontroller. [5]
- Q8)** a) Explain with neat diagram support devices of PIC 18F microcontroller. [5]
b) Explain flow charting in problem solving approach. [5]



Total No. of Questions : 8]

SEAT No. :

P3947

[5155]-199

[Total No. of Pages : 2

M.E. (Mechanical) (Mechatronics)
FLEXIBLE MANUFACTURING SYSTEM
(2013 Course) (Semester -III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Use of Electronic pocket Calculator is allowed.*
- 5) Assume Suitable data, if necessary and mention it clearly.*

Q1) Identify the factors that can be used to distinguish the manufacturing system in classification scheme. **[10]**

Q2) Why are continuous work transport systems uncommon on automated production lines. **[10]**

Q3) Name the factors that favor the use of manual assembly lines. **[10]**

Q4) What is difference between a hierarchical structure and chain-type structure used in classification and coding scheme. **[10]**

Q5) Enlist typical products that are made by automated assembly system with suitable example. **[10]**

P.T.O.

Q6) Write NC part program for the part shown in Fig.1. Assume suitable data.[10]

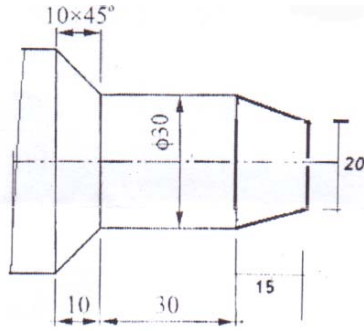


Fig. 1, Q. No..6.

Q7) Differentiate between FMS and FMC and Explain in detail a layout of FMS. [10]

Q8) Enlist the typical objectives when implementing cellular manufacturing. [10]



Total No. of Questions : 8]

SEAT No. :

P3948

[5155]-200

[Total No. of Pages :1

M.E. (Electrical Control System)
COMPUTER TECHNIQUES IN CONTROL SYSTEMS
(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answers Qu 1 or 2, Qu 3 or 4, Qu 5 or 6, Qu 7 or 8.*
- 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.*

Q1) Explain what do you understand by Lagrange Function. **[9]**

OR

Q2) Use analytical method to investigate for extremum point **[9]**

$$F(x) = -3x^4 + 10x^3 - 20.$$

Q3) Explain what do you understand by relative and global maximum. **[9]**

OR

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

$$F(x) = 0.5k_2x_1^2 + 0.5k_3(x_2 - x_1)^2 + 0.5k_1x_2^2 - Px_2 \quad [9]$$

Q5) Explain method of conversion of non serial system to serial system problem. **[16]**

OR

Q6) Use simplex method to solve **[16]**

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

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

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

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

$$X_1, X_2, X_3 > 0$$

Q7) a) Explain the step by step procedure of revised simplex method. **[8]**

b) Explain the multistage decision process in dynamic programming. **[8]**

OR

Q8) Explain the Gomory's cutting plane method. **[16]**



Total No. of Questions : 3]

SEAT No. :

P3949

[5155]-201

[Total No. of Pages : 1

**M.E.(Electrical : Control System)
PROCESS CONTROL MANAGEMENT
(2013 Pattern) (Semester - I) (503102)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer all questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Assume suitable if necessary.*

Q1) Solve any three.

[18]

- a) Describe the role of Leadership in process control management.
- b) Draw & explain block diagram of process control system.
- c) Explain Ziegler-Nichols closed loop method for tuning in detail.
- d) Describe with appropriate diagram, temperature control in process industry.

Q2) Solve any two.

[16]

- a) Develop a feed back control system for Heat exchanger.
- b) Draw a block diagram of feedback control system & for each component write transfer function relating its output to input.
- c) Explain generalized block diagram for feed forward-feedback control systems.

Q3) Solve any two.

[16]

- a) Explain interaction of control loops in a stirred tank heater for temperature control with suitable diagram.
- b) Explain the effect of interaction on stability of process control system.
- c) Describe the Relative Gain Array for a process with two inputs and two outputs.



Total No. of Questions : 6]

SEAT No. :

P3950

[5155]- 202

[Total No. of Pages : 2

**M.E. (Electrical) (Control Systems)
NON LINEAR CONTROL SYSTEM
(2013 Pattern) (Semester - I)**

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of algorithmic tables slide rule, Mollier charts, and electronic pocket calculator and steam table is allowed.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Explain peculiar characteristics of nonlinear control systems. [4]
b) Explain different types of singular points. [5]
c) Explain isocline method of constructing a phase plane trajectory for a given system. [5]
d) Explain the terms in the sense of Liapunov. [4]
i) Stability
ii) Asymptotic stability
iii) Global Asympototic stability
iv) Instability.

OR

- Q2)** a) Compare describing function and phase plane method used to analyze nonlinear control system. [4]
b) Explain delta method of constructing a phase plane trajectory for a given system. [5]
c) A given system $1/s(s+2)$ is cascaded with saturation nonlinear element of slope 1 and output $+/-1$. Find describing function. Comment on stability. [5]
d) Express scalar function given below in quadratic form and test it for definiteness. [4]

$$V(x) = 2x_1^2 + x_2^2 - 2x_3^2 + 2x_1x_2 - 3x_2x_3 + x_1x_3$$

P.T.O.

- Q3)** a) Explain Liapunov Direct method to determine stability. [8]
 b) Select Liapunov function and determine stability. [8]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

OR

- Q4)** a) The system equations are given below [8]

$$\dot{x}_1 = 2x_2, \dot{x}_2 = -x_1 - 3x_2$$

Select $V = x_1^2 + 2x_2^2$ as Liapunov function and determine stability.

- b) Explain any one method of construction of Liapunov functions. [8]

- Q5)** a) Explain Input Output linearization in sliding mode control techniques. [6]

- b) Explain any nonlinear control system design using sliding mode technique. [10]

OR

- Q6)** a) Explain the terms: [6]

- i) Sliding phase.
- ii) Reaching phase.
- iii) Chattering as used in sliding mode control.

- b) Determine the sliding dynamics along sliding set for the system. [10]

$$\dot{x}_1 = -2x_1 - x_2 + \text{sign}(-x_1 - x_2)$$

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



Total No. of Questions : 6]

SEAT No. :

P3951

[5155]- 203

[Total No. of Pages : 2

**M.E. (Electrical) (Control Systems / Power Electronics and Drives /
Power Systems)**

**RESEARCH METHODOLOGY
(2013 Pattern) (Semester - I)**

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Assume suitable data if necessary.*

- Q1)** a) Distinguish between research methods and research methodology. [6]
b) Why is it important to define research problem appropriately? [4]
c) What are the features of good research design? [4]
d) Give the importance of statistics in research. [4]

OR

- Q2)** a) Compare descriptive research and analytical research. [4]
b) What do you understand by critical literature review? [4]
c) What are the characteristics of good sample design? [4]
d) What are the different methods of data collection? Explain any two. [6]

- Q3)** a) What is the basic structure of ME / MTech thesis? Also explain the important parts of the thesis, highlighting the flow of dissertation work. [8]
b) Explain the technique and importance of oral presentation of research findings. [8]

OR

P.T.O.

- Q4)** a) Explain the features of LATEX used for preparing technical report. [8]
- b) Write short notes on following in the context with report / thesis writing.
- i) Title page [8]
 - ii) Table of content
 - iii) Recommendations.

- Q5)** a) Explain the following types of papers to report the research work. [8]
- i) Survey Paper
 - ii) Conference paper
- b) What are the different funding agencies and different schemes for engineering research? [8]

OR

- Q6)** a) State and explain the important steps involved in preparing a research proposal. Explain how budgetary aspect is important in research proposal. [10]
- b) Explain the following terms in detail [6]
- i) Copy write.
 - ii) Trade mark.



Total No. of Questions : 6]

SEAT No. :

P3952

[5155]-204

[Total No. of Pages : 2

M.E.(Electrical) (Control Systems)
MULTIVARIABLE AND OPTIMAL CONTROL SYSTEMS
(2013 Credit Pattern) (Semester-II) (End Sem.)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt Q.1or Q.2, Q.3 or Q.4, and Q.5 or Q.6.*
- 2) *Assume Suitable data if necessary.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figure to the right indicate full marks.*
- 5) *Your Answer will be valued as a whole.*

- Q1)** a) What are decoupling or non-interactive controls of MVCS design? **[5]**
- b) State the factors to be considered while formulating an optimal control problem using quadratic performance index. **[5]**
- c) How the stability of multivariable control system can be represented in state space? Give example. **[4]**
- d) A person driving an automobile is a MVCS. Explain and draw suitable block diagram. **[4]**

OR

- Q2)** a) Explain any one classical method that can be extended to analysis of multivariable control system. State its limitations. **[4]**
- b) Explain clearly the direct integration method for the numerical solution of reduced order matrix Riccati Equation. **[5]**
- c) Give description of pole placement using Linear state Variable Feedback in multivariable control system with block diagram. **[5]**
- d) State the conditions for controllability and observability of multivariable control system. **[4]**

P.T.O.

Q3) a) Describe the procedure for solving optimal control problem using Pontryagin's minimum principle. [8]

b) Find the optimal control u for the system $\dot{x} = u; x(0) = 1$ which minimizes

$$J = \frac{1}{2}x^2(4) + \frac{1}{2}\int_0^4 u^2 dt . \quad [8]$$

OR

Q4) a) Write down the relation between the Pontryagin's minimum principle and dynamic programming. [8]

b) Explain the Pontryagin's minimum principle. [8]

Q5) a) Explain the bang-bang control strategy and state the merits of bang-bang controller. [8]

b) Consider the system $\dot{x}_1 = x_2 + u_1$ and $\dot{x}_2 = u_2$. Find the optimal control u for

$$J = \frac{1}{2}\int_0^4 (u_1^2 + u_2^2) dt . \text{ Give that } x_1(0) = x_2(0) = 1, x_1(4) = 0 . \quad [8]$$

OR

Q6) a) Draw the block diagram showing the structure of Feedback time-optimal (minimum time) control system and explain with an example the minimum time-optimal control problem. [8]

b) Discuss briefly singular control problem. [8]



Total No. of Questions : 7]

SEAT No. :

P3953

[5155]-205

[Total No. of Pages : 2

M.E. (Electrical) (Control Systems)
SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL
(2013 Pattern) (Semester -II) (503108)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Q.3 is compulsory. Answer Q.1 or Q.2, Q.4 or Q.5, Q.6 or Q.7.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume Suitable data, if necessary.*

- Q1)** a) Explain any two nonparametric methods of system identification. [4]
b) Estimate the parameters a and b for the given model $y(t) = b_0 u(t) + b_1 u(t-1)$

t	0	1	2	3	4
$u(t)$	0	2	3	3	2
$y(t)$	0	1	5.5	7.5	7

[6]

OR

- Q2)** a) Consider that a set of data satisfy the model $y(t) = \phi^T(t)\theta + e(t)$; where $e(t)$ is a white noise with variance given by λ^2 . Derive the least square estimate $\hat{\theta}$ and prove that this estimate is equivalent to the true parameter vector. [5]
b) What do you understand by persistently exciting signal? Determine the order of the following signals. [5]
i) White noise.
ii) Step signal.
iii) Impulse.

- Q3)** Write notes on any four. [8]
a) Feature Extraction.
b) Learning without supervision.
c) Consistency of an estimator.
d) Recursive least square Estimation.
e) QR Factorization.
f) Bayesian learning

P.T.O.

- Q4)** a) What is gain scheduling. Give one example of this method of control. [8]
 b) Discuss the diophantine Equation with reference to the pole placement technique and give the algorithm for pole placement. [8]

OR

- Q5)** a) What are the various adaptive schemes and how are they implemented? [8]
 b) Explain the Indirect Self Tuning Regulator. Give the algorithm used for its implementation and discuss the issues with this type of scheme. [8]

- Q6)** An integrator given by. [16]

$G(s) = \frac{b}{s}$ is to be controlled by continuous time controller given by

$$u(t) = -\theta_1 y(t) + \theta_2 u_c(t)$$

The desired response model is given by $\frac{dy_m}{dx} = -a_m y_m + b_m u_c$.

Derive using both MIT rule and Lyapunov theory, the parameter update law for an MRAS such that the error e goes to zero.

$$\text{Assume } V(\theta) = \frac{1}{2} \left[e^2 + \frac{1}{b\gamma} (b\theta_1 - a_m)^2 + \frac{1}{b\gamma} (b\theta_2 - b_m)^2 \right]$$

Draw the block diagram of the both the systems.

OR

- Q7)** a) Derive the MIT rule and explain the sign-sign algorithm. [4]
 b) Consider a position servo described by

$$\frac{dv}{dt} = -av + bu \quad \text{and} \quad \frac{dy}{dt} = v; \quad \text{where } a \text{ and } b \text{ are unknown.}$$

Assume the control law $u = \theta_1(u_c - y) - \theta_2 v$ 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 : 3]

SEAT No. :

P3954

[5155]-206

[Total No. of Pages :2

M.E. (Electrical: Control System)
ADVANCED DIGITAL CONTROL TECHNIQUES
(2013 Course) (Semester - II) (503109)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer all questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Assume Suitable data, if necessary.*

Q1) Solve any three.

[3×6=18]

- a) Explain decimation and interpolation process with the help of spectral analysis.
- b) For the system with pulse transfer function,

$$G(Z) = \frac{(Z+1)}{(Z^2 + 1.3Z + 0.4)};$$

Draw state diagram and obtain state model by parallel digital programming method.

- c) Consider the system:

$$X(K+1) = GX(k) + Hu(k); \quad \text{where, } G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix}; \quad H = \begin{bmatrix} 0 \\ 1 \end{bmatrix}.$$

Determine a suitable state feedback gain matrix 'K' such that the system will have closed loop poles at $Z = 0.5 \pm j0.5$

- d) Write a short note on digital PID controller.
- e) Explain the steps in the design of digital state observer.

P.T.O.

Q2) Solve any two.

[2×8=16]

- a) Discuss effect of finite word length in digital filters.
- b) What is fixed point and floating point DSP?
- c) Explain the concept of instruction pipeline.

Q3) Solve any two.

[2×8=16]

- a) Explain different addressing modes of TMS320C54X.
- b) What are the applications of TMS 320 typical DSP processor?
- c) Give functional block diagram of TMS320C54X.



Total No. of Questions : 6]

SEAT No. :

P3955

[5155]- 207

[Total No. of Pages : 2

M.E. (Electrical) (Control System)
ADVANCED DRIVES AND CONTROL
(2013 Credit Pattern) (Semester - III) (603101)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answers Q1 or Q2, Q3 or Q4, Q5 or Q6.*
- 2) *Figures to the right indicate full marks.*

- Q1)** a) Compare AC and DC drives [4]
b) Discuss closed loop control of converter fed dc motor drive. [5]
c) Explain the effect of space harmonics and time harmonics present in the current on the performance of a three phase inverter fed induction motor. [5]
d) Write a note on sensorless vector torque control of three phase induction motor drive. [4]

OR

- Q2)** a) Obtain thermal model of motor for heating and cooling. [5]
b) Draw a neat diagram of the system model and derive the transfer function of converter fed dc drives. [4]
c) Write short note on current source inverter fed variable frequency induction motor drive. [4]
d) Write a note on direct torque control of three phase induction motor drive. [5]

- Q3)** With reference to control of synchronous motor drive, explain the following:
a) Wound field machine drive [8]
b) Switched Reluctance Motor drive. [8]

OR

P.T.O.

Q4) With reference to permanent magnet synchronous motor, explain the following:

a) Sinusoidal SPM drive [8]

b) Trapezoidal SPM drive [8]

Q5) a) Write a note on modern trends in electric drives control. [8]

b) Write a detail note on industrial application of PID controller. [8]

OR

Q6) a) Explain the application of phase locked loop in the closed loop control of electric drive. [8]

b) Write a detail note on design procedure of current control in a closed loop control of electric drive. [8]



Total No. of Questions : 6]

SEAT No. :

P3956

[5155]-208

[Total No. of Pages : 3

M.E. (Electrical) (Control System)
COMPUTERAIDED CONTROL SYSTEM DESIGN
(2013 Course) (Semester - III) (603102)

Time : 3 Hours]

[Max. Marks : 50

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.*

- Q1)** a) Explain the concept Relative stability and Absolute stability. Explain the measures of relative stability using polar plot and bode diagrams. [6]
- b) Compare cascade compensation with feedback compensation. Discuss the conditions under which the feedback compensation is preferred.[6]
- c) Outline the computer method for obtaining the transient response of a linear closed loop control system represented by the transfer function $C(s)/R(s)$. Give its algorithm and draw the flow chart. Also explain how to reshape this transient plot to obtain desired response. [6]

OR

- Q2)** a) Explain the computer method for obtaining the solution of state and output equations of a closed -loop control system represented by [8]
- $$\dot{x}(t) = Ax(t) + Bu(t)$$
- $$y(t) = Cx(t)$$
- With usual notation. Give its algorithm.
- b) Draw the block diagram of observer system and explain with the designing steps of full order observe. [4]
- c) Explain the computer method for determine the controllability and observability of the control system, draw the flow chart and give its algorithm. [6]

P.T.O.

- Q3)** a) What are the considerations for the selection of P, PI and PID controller? Explain why the derivation controller is not used in isolated mode? [8]
- b) Consider a process control system with plant transfer function [8]

$$G_p(s) = \frac{30}{s^3 + 11s^2 + 36s + 36}$$

Design a PID controller for this system using Ziegler-Nichols method.

OR

- Q4)** a) Explain with diagram the working of P, PI and PID controller as standard compensator. [8]
- b) Explain step by step the design procedure of tuneable PID controller using Ziegler - Nicol's method. Give its algorithm. [8]
- Q5)** a) Discuss the advantages of digital controller over continuous time controller; also explain the problems in implementing digital control system. [4]
- b) State and explain the implementation problems in digital control. [4]
- c) A discrete time control system is represented by the differential equation $x(k + 1) = Fx(k) + Gu(k)$. Where k is the sampling instant, $x(k)$ is $n \times 1$ state vector, $u(k)$ is $m \times 1$ control vector, F and G are constant matrices of compatible dimensions. Explain the computer method for obtaining closed loop system response. Draw flow chart and give its algorithm. [8]

OR

- Q6)** a) Draw the block diagram of a typical digital control system and explain clearly the working of each block. What is the effect of sampling period 'T' on the stability of the system? [4]

- b) Consider the system [8]

$$x(k+1) = Gx(k) + Hx(k)$$

$$y(k) = Cx(k)$$

$$u(k) = K_o r(k) - Kx(k),$$

$$\text{where } G = \begin{bmatrix} 0 & 1 \\ 0.16 & 1 \end{bmatrix}, H = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, C = [1 \quad 0]$$

Determine a suitable state feedback gain matrix K such that the system will have the closed loop poles at $z = 0.5 + j0.5$, $z = 0.5 - j0.5$.

- c) Justify the statement “When the analog controller is replaced by the equivalent digital controller the static error constant for the analog and equivalent digital control system must agree” [4]



Total No. of Questions : 3]

SEAT No. :

P3957

[5155]-209

[Total No. of Pages : 1

M.E. (Electrical) (Power Electronics & Drives)
MODELING AND ANALYSIS OF ELECTRICAL MACHINES
(2013 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) a) Explain basic 2 pole primitive machine. Write the voltage equations for Kron's primitive machine. **[8]**

OR

- a) Derive the expression for instantaneous speed of a separately excited dc motor. From the expression, discuss the conditions namely starting on no load, change in load. **[8]**
- b) Giving example, explain the term 'Invariance of power as applied to transformation theory in Electrical machines. **[10]**

OR

- b) From the voltage equations in d-q frame, derive the expression for instantaneous torque of a three-phase induction motor. **[10]**

Q2) a) A 3 phase, 50 Hz cylindrical-rotor synchronous machine has the following parameters: **[10]**

Armature leakage inductance = 0.45 mH

Self-inductance for phase A 3.25 mH

For this machine, calculate the Synchronous reactance

- b) Using the impedance matrix for a 3-phase, 4-salient pole synchronous machine fitted with amortisseurs, derive the expression for instantaneous torque. **[6]**

Q3) Write the short notes on: (any two) **[16]**

- a) Linearised model of Synchronous machine
- b) Linearised model of Induction motor.
- c) Small displacement stability.

x

x

x

Total No. of Questions : 6]

SEAT No. :

P3958

[5155]-210

[Total No. of Pages :1

M.E. (Electrical) (Power Electronics & Drives)
ENERGY MANAGEMENT AND POWER QUALITY IN
ELECTRICAL DRIVES
(2013 Pattern) (Semester - I) (503302)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Use of Calculator is allowed.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) What are symptoms of poor power quality? [9]
b) Discuss optimal selection of Pumps and Fans. [9]

OR

- Q2)** a) Write note on maintenance of capacitors and various losses in the capacitors. [9]
b) Explain in detail capacitor size and location fixation criterion. [9]

- Q3)** a) Explain in detail power quality benchmarking. [8]
b) What is voltage flicker? What are the various causes of voltage flicker? [8]

OR

- Q4)** a) Elaborate power quality state estimations? [8]
b) Elaborate necessity and operation of voltage regulation devices. [8]

- Q5)** a) Explain the application of intelligent system in power quality monitoring. [8]
b) Write detail note on Power quality measuring equipment. [8]

OR

- Q6)** a) Discuss the different power quality monitoring standards. [8]
b) Explain objectives and consideration of power quality monitoring. [8]



Total No. of Questions : 6]

SEAT No. :

P3959

[5155]- 211

[Total No. of Pages : 2

M.E. (Electrical) (Power Electronics & Drives)

POWER CONVERTERS

(2013 Pattern) (Semester - I) (503303)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) A single phase half controlled converter is used to supply the field winding of a separately excited dc machine. With the rated armature voltage the motor operates at the rated no load speed for a firing angle $\alpha = 0^\circ$. Find the value of α which will increase the motor no load speed by 30%. Neglect losses and saturation. Assume continuous conduction. **[10]**

b) Explain the Boost Converter with necessary waveforms. **[8]**

OR

Q2) a) Explain three phase Voltage Source Inverter (120° conduction mode) with necessary waveforms and derive the line-line output voltage equation using Fourier Series. **[10]**

b) A single phase full wave bridge converter is connected to RLE load. The source voltage is 230V, 50Hz. The average load current is 10 A is continuous over working range. For $R=0.4$ ohms and $L=2$ m H, Compute firing angle delay for $E=120$ V and $E = -120$ V **[8]**

Q3) a) With a neat diagram explain zero voltage switching (ZVS) resonant switch converter. **[8]**

b) Write a short note on Zero voltage and Zero current switching. **[8]**

OR

Q4) a) With a neat diagram explain the working of parallel loaded resonant half bridge dc-dc converter. **[8]**

b) Compare ZCS and ZVS topologies. **[8]**

P.T.O.

- Q5) a)** Explain with a neat diagram working of a single-phase bridge-type cycloconverter. **[8]**
- b) Explain three phase AC voltage controller with necessary circuit diagram and waveforms. **[8]**

OR

- Q6) a)** Draw a neat diagram explain the working of single phase full wave AC voltage controller with R load. **[6]**
- b) A single phase voltage controller is used for controlling power flow from 230V, 50Hz source into load circuit consisting of $R = 3 \text{ ohm}$ and $\omega L = 4 \text{ ohms}$ Calculate **[10]**
- Control range of firing angle
 - Maximum value of average current
 - Maximum value of RMS value load current
 - Maximum power and power factor.



Total No. of Questions : 8]

SEAT No. :

P3960

[5155]-212

[Total No. of Pages : 2

M.E.(Electrical) (Power Electronics & Drives)

AC AND DC DRIVES

(2013 Pattern) (Semester-II)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 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.*

- Q1)** a) Discuss static Kramer drive system. Explain speed control strategy with firing angle of converter as input command. **[5]**
- b) Explain field oriented control of induction motor. State the merits of vector control of induction motor. **[4]**

OR

- Q2)** a) Discuss speed control of DC separately excited motor fed from single phase full-converter for continuous mode operation. **[5]**
- b) Explain single quadrant operation of DC chopper fed Series motor. Evaluate the performance parameters. **[4]**

- Q3)** a) Explain closed loop speed control of induction motor using stator voltage to stator frequency control. **[5]**
- b) Explain implementation of vector control of induction motor for stator field oriented control of induction motor. **[4]**

OR

P.T.O.

Q4) a) Discuss two quadrant operation of DC chopper fed separately excited DC motor. [5]

b) Explain speed control of DC separately excited motor fed from fully controlled converter for continuous conduction mode. Also discuss output waveform and output equation. [4]

Q5) a) Explain the operation and driver circuit of Brushless DC motor. Also explain induced voltages, phase current and torque equation. [8]

b) Explain the construction and operation of variable reluctance motor. Also discuss the control circuit and motor performance characteristics. [8]

OR

Q6) a) What is multi-stack stepper motor. Discuss its performance characteristics. [8]

b) Explain the modes of operation of switched reluctance motor. Discuss its control circuit and performance characteristics. [8]

Q7) a) Explain the dynamic model of three phase Induction motor. [8]

b) Derive the Transfer Function of separately excited DC motor. [8]

OR

Q8) a) Express the dynamic model of three phase Induction motor in different reference frames. [8]

b) Derive the transfer function of armature controlled separately excited DC motor and draw the control system diagram. [8]



Total No. of Questions :8]

SEAT No. :

[Total No. of Pages :2

P3961

[5155] - 213

**M.E. (Electrical) (Power Electronics and Drives)
DESIGN OF POWER ELECTRONIC SYSTEMS
(2013 Course) (Semester - II) (503308)**

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any one from 1 & 2, 3 & 4, 5 & 6, 7 & 8.*
- 2) *Neat diagrams to the right indicate full marks.*
- 3) *Use of calculator is allowed.*
- 4) *Assume suitable data if necessary.*

Q1) Derive mathematical model of IGBT. **[9]**

OR

Q2) Derive the mathematical modeling of single phase inverter using circuit averaging method. **[9]**

Q3) a) Design a heat sink for a dc-dc Buck system. **[6]**

- b) For the Buck converter, find the peak device current, the peak dissipation and the case to ambient thermal resistance. Use maximum junction temperature of 150°C and the ambient temperature to be at 40°C and the case temperature should not exceed 60°C. Duty ratio is 40%. The thermal impedance at 400mS is $Z=0.4^{\circ}\text{C}/\text{W}$. **[3]**

OR

Q4) An inductor is to be designed to meet the following specifications. $L = 5$ millihenries ; $I_{\text{rms}} = 3$ A sinewave ; $f = 100$ kHz ; $T_s = 90$ C and $T_a = 30$ C. The inductor is to be fabricated on a double-E core made from 3F3 ferrite. The windings are to be made with foil conductors which have $k_{cu} = 0.6$. A core size of $a = 2$ cm is chosen for the design. the emissivity E of the surface of the completed inductor equals 0.9 and that the vertical height is $3a$. **[9]**

- a) Determine the conductor cross-sectional area, A_{cu} , and number of turns N . Ignore eddy currents and the proximity effect.
- b) Specify the length of the airgaps in the core. Assume four distributed airgaps.

P.T.O.

Q5) Explain the zero voltage switching technique in a Buck converter with necessary diagrams and waveforms. **[16]**

OR

Q6) Design a 2.5V, 1A Buck converter from a 12V dc source. The output voltage ripple should be less than 1% of the dc output voltage magnitude. The switching frequency is required to be 50 kHz. Consider the minimum load current to be 10% of load to maintain continuous conduction mode. **[16]**

Q7) a) Explain R and R-C based thyristor firing circuit with circuit diagram and their respective limitations. **[8]**

b) Explain need of Isolation Explain isolation circuit using optical isolator. **[8]**

OR

Q8) a) Explain how gate drive of MOSFET is provided with isolation using optical isolator. **[8]**

b) Explain turn on snubber in detail. **[8]**

EEE

Total No. of Questions : 4]

SEAT No. :

P3962

[5155]-214

[Total No. of Pages :1

M.E. (Electrical) (Power Electronics and Drives)

ADVANCED CONTROL SYSTEMS

(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

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) *Assume suitable data if necessary.*
- 5) *Use of electronic calculator is allowed.*

- Q1)** a) What are the merits of the pole placement method? Derive an expression of pole placement gain using Ackermann's formula. [5]
b) Write short note on any two optimal control problems. [4]

OR

- b) Derive an expression for linear quadratic regulator gain matrix K. [4]
Q2) a) Explain all the signal norms. [4]
b) Explain any one linearization method in detail with the help of an example. [5]

OR

- b) Transform the following system to normal form. [5]

$$\dot{x} = \begin{bmatrix} -x_1^3 \\ \cos x_1 \cos x_2 \\ x_2 \end{bmatrix} + \begin{bmatrix} \cos x_2 \\ 1 \\ 0 \end{bmatrix} u \text{ and } y = x_3$$

- Q3)** a) Explain the properties of Sliding Mode Control. [6]
b) What is chattering in sliding mode control? Explain its causes. [6]
c) Differentiate between Variable Structure Control and Sliding Mode Control. [4]

- Q4)** a) Derive transfer function of buck converter using switching or averaging model. [6]
b) Explain in detail power quality devices Harmonic and Spectrum analyzer. [6]
c) With diagram explain distribution generation in detail. [4]



Total No. of Questions : 6]

SEAT No. :

P3963

[5155]- 215

[Total No. of Pages : 2

M.E. (Electrical) (Power Electronics and Drives)

POWER ELECTRONICS APPLICATIONS

(2013 Pattern) (Semester - III)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) What is the role of power electronics in power system in today's context. Explain any one application of power electronics in power system. [6]
- b) List the issues to be addressed while integrating solar PV system with the grid. [6]
- c) What is importance of harmonics in HVDC operation? How is characteristics harmonic different from non characteristics harmonic?[6]

OR

- Q2)** a) What is a Static VAR system? Explain the different types of SVS schemes. [6]
- b) Discuss criteria of design of ac filters. Also mention various types of ac filters and also show their circuit configurations. [6]
- c) Draw the block diagram and explain in brief the operation of wind energy system. [6]
- Q3)** a) Compare the rotating synchronous compensator with STATCOM. Explain the working of six pulse STATCOM with the help of block diagram. [8]
- b) Starting with basic principle explain the operation of UPFC connected to sending end. [8]

OR

P.T.O.

Q4) a) Explain in detail the various output voltage control methods of STATCOM. [8]

b) Describe the principle of following controls in UPFC [8]

i) Control of shunt converter

ii) Control of series converter

Q5) Describe following power electronic applications using various possible techniques for [16]

a) Induction heating

b) Electric welding

OR

Q6) Describe following power electronics applications using various possible techniques

a) Switched mode power supply [8]

b) AC-DC electric locomotive systems. [8]



Total No. of Questions : 8]

SEAT No. :

P3964

[5155]-216

[Total No. of Pages :2

M.E. (Electrical) (P.E.D.)

POWER ELECTRONICS IN SMART GRID

(2013 Course) (Semester - III) (603302)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

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

Q1) a) Describe local energy networks. [4]

b) What are the EMC cases in distributed power system? [5]

OR

Q2) a) What are the legal and organizational regulations of power quality? [5]

b) Describe various energy storage devices. [4]

Q3) a) Explain any two high frequency space applications. [4]

b) Write a note on “distributed generation past and future”. [5]

OR

Q4) a) Describe any two automotive motor drives. [4]

b) What are the challenges of integration of distributed energy resources? [5]

Q5) a) Differentiate between Home Area Network (HAN), and wide Area Network (WAN). [8]

b) Explain Bluetooth communication technology. [8]

OR

P.T.O.

- Q6)** a) Describe ZigBee and GPS communication methods. [8]
b) Explain Wi-Fi based communication with its applications. [8]

- Q7)** a) Describe AC/AC voltage regulators. [8]
b) Explain operation of D-STATCOM for Load compensation. [8]

OR

- Q8)** a) Explain working of dynamic voltage sag/swell restorer. [8]
b) Describe dynamic static synchronous series controllers. [8]



Total No. of Questions :5]

SEAT No. :

P3965

[Total No. of Pages :2

[5155] - 217

M.E. (Electrical) (Power System)

COMPUTER APPLICATIONS IN POWER SYSTEMS

(2013 Course) (Semester - I) (503201)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Q 1 is compulsory.*
- 2) *Solve Q2 or Q3 and Q4 or Q5.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of scientific non-programmable calculator is allowed.*
- 6) *Assume suitable data if necessary.*

Q1) Solve any THREE:

[18]

- a) Maximize $f(X) = 3x_1^2 + 14x_1x_2 - 8x_2^2$ subjected to $3x_1 + 6x_2 \leq 72$ and $x_1, x_2 \geq 0$.
- b) Write the algorithm to optimize a multi-variable objective function using steepest descent (Cauchy) method.
- c) Explain contingency analysis and security monitoring used in power system analysis.
- d) Explain Newton Raphson's load flow (polar form) method with assumptions.

Q2) a) A power plant has three units with the following cost characteristic **[8]**

$$C_1 = 0.5P_1^2 + 215P_1 + 5000 \quad Rs / h$$

$$C_2 = 1.0P_2^2 + 270P_2 + 5000 \quad Rs / h$$

$$C_3 = 0.7P_3^2 + 160P_3 + 9000 \quad Rs / h$$

P.T.O.

where P_i is power generated by i^{th} station in MW . The maximum and minimum load allocation on each unit is $150 MW$ and $39 MW$ respectively. Find the economical load scheduling for a total load of $200 MW$.

- b) Explain classical economic load dispatch with algorithm considering limits. [8]

OR

- Q3)** a) The cost characteristic of two units in a plant are [8]

$$C_1 = 0.4P_1^2 + 160P_1 + K1 \text{ Rs / h}$$

$$C_2 = 0.45P_2^2 + 120P_2 + K2 \text{ Rs / h}$$

where P_i is power generated by i^{th} station in MW . Find the optimal load allocation between the two units, when the total load is $162.5 MW$. What will be the daily loss if the units are loaded equally.

- b) Explain solution economic load dispatch problem using Newton-Raphson method. [8]

- Q4)** a) Derive general formula of fault current and fault voltage for LG type fault. [8]

- b) Show that transmission loss formula is a function of generation and load. [8]

OR

- Q5)** For the system shown in Fig.5 find the loss of coefficients in MW^{-1} , if the base is $100 MVA$. Given that [16]

$$I_{L1} = (1.0 - j0.2) pu \text{ and } I_{L2} = (0.5 - j1.0) pu$$

$$Z_a = (0.02 + j0.1) pu, Z_b = (0.03 + j0.15) pu, Z_c = (0.05 + j0.25) pu$$

$$I_{21} = (0.25 - j0.05) pu, V_1 = 1.0 \angle 0^\circ pu$$

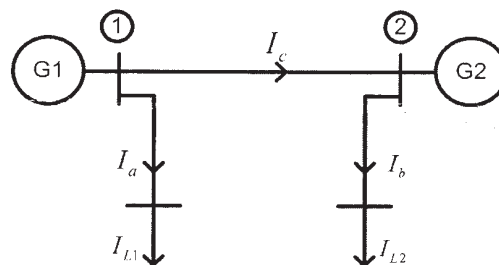


Figure 5

EEE

Total No. of Questions : 5]

SEAT No :

P3966

[5155]-218

[Total No. of Pages : 2

M.E. (Electrical) (Power Systems)
POWER SECTOR ECONOMICS AND MANAGEMENT
(2013 Course) (Semester-I)

Time : 3 Hours]

[Max.Marks:50

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.*

Q1) Attempt any three of the following: **[18]**

- a) Discuss new challenges imposed by restructured Indian power sector.
- b) For a power project initial investment of Rs.10 lacs is required. After implementation of the project expected annual returns for six years are Rs.1.5 lacs, Rs.2 lacs, Rs.2.5 lacs, Rs.3 lacs, Rs.3.5 lacs and Rs.3 lacs respectively. Taking discounting factor of 12% calculate net present value of the project
- c) Explain rate of return regulation. Explain effect of subsidy and cross subsidy in tariff.
- d) Compare wholesale competition and retail competition models.
- e) Explain factors to be considered in deciding tariff for electricity production from renewable energy.
- f) Explain institutional structure of indian power sector undergoing reforms.

Q2) a) Explain terms price elasticity and demand elasticity. Also explain effect of these on power market. **[8]**
b) What is market power? Why it exists? Is it required to control? justify. **[8]**

OR

Q3) a) Explain marginal pricing and Zonal pricing of electricity. What are the effects of these prices on operation of power system? **[8]**
b) Explain early state electricity reforms in India. Why this model failed? **[8]**

P.T.O.

- Q4)** a) Explain different methods used for pricing transmission pricing. [8]
b) What are transmission rights? Explain effect of these on operation of restructured power sector. [8]

OR

- Q5)** a) Explain Availability Based Tariff. Is it useful in restructured power sector? How? [8]
b) Explain [8]
i) Role of load dispatch centres in allocating transmission services.
ii) Use of game theory methods for power systems.



Total No. of Questions : 7]

SEAT No. :

P3967

[5155]- 219

[Total No. of Pages : 2

**M.E. (Electrical) (Power systems)
Power System Modelling
(2013 Pattern) (Semester - I) (503203)**

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Solve Total Four questions. Answer any 2 from Q1, Q2 and Q3. Answer 1 question from Q4 or Q5, and Q6 or Q7 each.*
- 2) *Assume Suitable data, if necessary.*
- 3) *Write down all the assumptions made.*

Q1) Derive the stator and rotor voltage equations considering generator convention for a synchronous machine of model 1.1. Write down assumptions involve in it. **[9]**

Q2) Derive the model of phase shifting transformer having complex turns ratio of $n=n \angle \alpha$. Draw an equivalent circuit diagram, for the phase shifting transformer if turns ratio is equal. **[9]**

Q3) Develop the mathematical model of ' π ' circuit medium transmission line. Also state the effect of assumptions made for ' π ' circuit model on the receiving end voltage and current. **[9]**

Q4) Write down a working of d.c exciter excitation control scheme of alternator. Also state and explain modifications needed in developing dc exciter with pilot exciter scheme. Draw appropriate diagrams wherever require. **[16]**

OR

Q5) What is role of voltage regulator in excitation system. Explain working of solid state voltage regulator. Draw suitable block diagram. **[16]**

P.T.O.

Q6) What is the use of Park's transformation in power system modeling? Write down the applicability of Clarke's transformation in power system. Also write its relationship with Park's transformation. **[16]**

OR

Q7) What is the significance of load modeling in power system? Write down in details the various types of static load modeling represented in power system. Discuss about the assumptions and approximations involved in it. **[16]**

Given: Parks transformation [p]

$$[P]=\begin{bmatrix} K_d \cos\theta & K_q \sin\theta & K_o \\ K_d \cos(\theta-\frac{2\pi}{3}) & K_q \sin(\theta-\frac{2\pi}{3}) & K_o \\ K_d \cos(\theta+\frac{2\pi}{3}) & K_q \sin(\theta+\frac{2\pi}{3}) & K_o \end{bmatrix}$$

$$\text{Where } K_d = K_q = \sqrt{\frac{2}{3}} \quad K_o = \sqrt{\frac{1}{3}}$$



Total No. of Questions : 6]

SEAT No. :

P3968

[5155]-220

[Total No. of Pages : 2

**M.E.(Electrical) (Power Systems)
POWER SYSTEM DYNAMICS
(2013 Pattern) (Semester-II) (503207)**

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Solve Total Three questions. Answer any one from Q1 and Q2, Q3 or Q4, and Q5 or Q6 each.*
- 2) *Assume Suitable data if necessary.*
- 3) *Write down all the assumptions made.*

Q1) Derive stator and rotor equation of synchronous generator represented by model 1.1. Write down assumptions involve in it. **[18]**

OR

Q2) Explain the point by point method for the analysis of transient stability with the help of appropriate graphs and equations. State clearly the assumption made. **[18]**

Q3) Derive an expression for small signal analysis of multi-machine system considering simplified model of synchronous machine. State any assumption made. **[16]**

OR

Q4) Derive an equivalent swing equation for two interconnected non coherent machines. The machines are having inertia constants H_1 , and H_2 and load angles δ_1 and δ_2 . Prove that the equation of such case is equivalent to swing equation of single machine connected to infinite bus system. Also state the mode in which system can operate. **[16]**

P.T.O.

Q5) State and discuss various types of is landing. Also explain various implications of in advertent is landing [16]

OR

Q6) Explain the terms voltage instability and voltage collapse. Discuss the factors affecting it. Also explain effect of additional loading on stable system in view on above terms. [16]



Total No. of Questions :5]

SEAT No. :

P3969

[Total No. of Pages :2

[5155] - 221

M.E. (Electrical) (Power System)

POWER SYSTEM PLANNING & RELIABILITY

(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Solve total three questions. Q 1 is compulsory. Solve Q2 or Q3. Solve Q4 or Q5.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

Q1) Solve any three:

[18]

- a) What are the factors which affects load forecasting? Explain in detail extrapolation and peak load forecasting methods.
- b) Explain Poisson distribution and Weibull distribution method in details.
- c) Explain recursive technique of reliability evaluation.
- d) What do you mean by integrated resource planning (IPR).

Q2) a) Explain the concept of transmission reliability and data required for composite system reliability. **[10]**

b) Describe the factors affecting transmission system planning. **[6]**

OR

Q3) a) Explain the procedure and steps for transmission system planning. **[10]**

b) What are the objectives of transmission planning? **[6]**

P.T.O.

Q4) a) Explain the following concept in context with distribution system planning and reliability. **[10]**

i) Weather effects.

ii) Interruption indices.

b) Explain interruption indices in distribution system reliability evaluation. **[6]**

OR

Q5) a) Explain various factors to be considered in distribution system planning. **[10]**

b) Write a short note on radial network & it's reconfiguration. **[6]**

EEE

Total No. of Questions : 5]

SEAT No. :

P3970

[5155]-222

[Total No. of Pages :1

M.E. (Electrical) (Power System)
HVDC AND FLEXIBLE AC TRANSMISSION
(2013 Pattern) (503209) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

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.*

Q1) Solve any THREE:

[3 × 6 = 18]

- a) Explain the working of static synchronous series compensator (SSSC).
- b) Explain the operation and function of UPFC with a block diagram.
- c) Explain power flow control in HVDC system.
- d) Explain the working of STATCOM with control block diagram.
- e) Compare HVDC and HVAC Transmission systems.

Q2) a) Explain HVDC protection schemes used against over current. **[8]**

b) What are the controls in VSC DC system implemented. **[8]**

OR

Q3) a) Explain the details of HVDC system with functions of different components. **[8]**

b) Explain the importance of HVDC grounding & how it is achieved in practice? **[8]**

Q4) a) Write about multi terminal HVDC systems configurations. **[8]**

b) Explain the principle & operation of VSC (Voltage Source Converter) of HVDC transmission. **[8]**

OR

Q5) a) Write about the different existing HVDC links and proposed links in India. **[8]**

b) Compare VSC HVDC with conventional HVDC. **[8]**



Total No. of Questions : 7]

SEAT No. :

P3971

[5155]-223

[Total No. of Pages :2

M.E. (Electrical) (Power System)
ADVANCED POWER SYSTEM PROTECTION
(2013 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7.*
- 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.*

Q1) Give detailed mathematical treatment of Least Error Squared (LES) technique. State the assumptions made. **[9]**

OR

Q2) Explain how travelling wave Phenomenon is used for digital protection of UHV transmission line. **[9]**

Q3) Explain abnormal operating conditions that can occur in case of synchronous generator. Explain microprocessor based unit protection scheme. **[9]**

OR

Q4) Explain overvoltage inrush current phenomenon in case of transformer. How this is considered in digital protection of transformer using % differential protection scheme. **[9]**

Q5) a) With necessary diagrams, explain three stepped distance protection scheme. **[8]**

b) Explain co-ordination of distance relays. **[8]**

OR

P.T.O.

- Q6)** a) Explain co-ordination of over current relays. [8]
b) Explain applications of computer graphics. [8]

Q7) Answer any Two: [16]

- a) Develop algorithm for short circuit studies.
b) Explain transformation to symmetrical components. Write all necessary equations.
c) Develop algorithm for calculating system conditions after the occurrence of faults.
d) Explain short circuit studies in multi-phase systems.



Total No. of Questions : 5]

SEAT No. :

P3972

[5155]-224

[Total No. of Pages : 2

M.E. (Electrical) (Power Systems)
POWER QUALITY ASSESSMENT AND MITIGATION
(2013 Course) (Semester - III) (603202)

Time : 3 Hours]

[Max. Marks : 50

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.*

Q1) Attempt any three.

[18]

- a) What are the symptoms of poor power quality? Also define power quality as per IEEE 1159.
- b) Explain various sources of light flickers. Explain how flickers are measured?
- c) Explain voltage sag characteristics. Also discuss effect of type of fault fault-location , fault level and ferderlength on sag.
- d) Explain in detailed about harmonics generation from synchronous and induction machine.
- e) Explain filter design criteria and selection of components in passive filters.

Q2) a) Importance of data in power quality assessment .Explain factors for setting threshold for monitors. **[8]**

- b) Explain with example system wide and discrete power quality monitors. **[8]**

OR

Q3) a) Selection of power quality monitors for power quality monitoring.Explain role and importance of A/D converter and fourier transform. **[8]**

P.T.O.

b) Write in detailed about monitoring location, time interval and period and data analysis tools. [8]

Q4) a) Explain mitigation techniques of power quality from customer point of view. Explain with examples. [8]

b) Explain observability analysis in power quality assessment and mitigation. [8]

OR

Q5) a) Can power quality be assessed under wave form distortion? If so what way it is different from assessment under sinusoidal supply. [8]

b) How standard test systems can be used for power quality. Explain with suitable example. [8]



Total No. of Questions :8]

SEAT No. :

P3973

[Total No. of Pages :3

[5155] - 225

M.E. (Electronics) (Digital Systems)

MICROELECTRONICS

(2013 Credit Pattern) (Semester - I) (504101)

Time : 3 Hours]

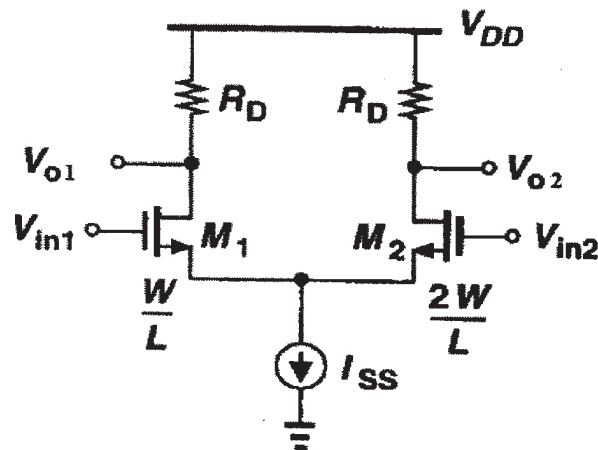
[Max. Marks :50

Instructions to the candidates:

- 1) Solve any five questions.
- 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.

Q1) a) Derive the expression for gain of common source amplifier with resistive load. [4]

b) For following figure M2 is twice as wider as M1. Calculate the small signal gain if the bias values of V_{in1} and V_{in2} are equal. [4]



c) Draw the MOS small signal Model and explain. [2]

Q2) a) Implement the following circuits using transmission gates. [5]

- i) 4:1 MUX
- ii) AND gate

b) With the help of neat circuit diagram explain tristate inverter. [5]

P.T.O.

- Q3) a)** Draw and explain fabrication steps for the n-well and p-well processes. **[5]**
- b) Design and draw the static CMOS circuit for the Boolean expression $Y = \overline{(A + B + C)} \cdot D$. Sketch the stick diagram and estimate the cell width and height for the same circuit. **[5]**
- Q4) a)** What do you mean by scaling in CMOS VLSI circuits? Describe various scaling techniques. **[5]**
- b) Derive an expression for dynamic power dissipation in a CMOS inverter circuit. **[5]**
- Q5) a)** Explain beta ratio effects and noise margins with reference to CMOS inverter. **[5]**
- b) Explain the interconnect impact on delay and cross talk. **[5]**
- Q6) a)** What are different power reduction techniques in low power design. **[4]**
- b) Compare TTL, CMOS and BiCMOS logic families. **[4]**
- c) Calculate the approximate power dissipation in a chip operating with $V_{dd} = 1.8V$ at 100MHz with an internal switched capacitance of 300pF. **[2]**
- Q7) a)** Sketch transistor level schematic for a single stage CMOS logic gate for each of the following functions. **[4]**
- i) $Y = \overline{AB + CD}$
- ii) $Y = \overline{(\overline{AB + C}) \cdot D}$
- iii) $Y = \overline{ABCD}$
- iv) $Y = \overline{A + B + C + D}$

- b) Write short notes (any two): [4]
- i) Body Effect
 - ii) Dynamic Circuit
 - iii) Bi CMOS Circuit
- c) Explain how CMOS inverter can be used as an amplifier. [2]
- Q8)** a) Explain the following non-ideal I-V effects. [5]
- i) Velocity saturation
 - ii) Sub threshold conduction.
- b) With the help of detailed equivalent circuit diagram explain parasitic capacitances involved in a MOSFET. [5]

EEE

Total No. of Questions : 8]

SEAT No :

P3974

[5155]-226

[Total No. of Pages :2

M.E. (Electronics) (Digital Systems)
DIGITAL SIGNAL PROCESSING ARCHITECTURE
(2013 Course) (Semester-I) (504102)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions out of eight questions.*
- 2) *Figures to the right side indicate full marks*
- 3) *Assume suitable data if necessary.*
- 4) *Use of scientific calculator is allowed.*

- Q1)**a) Describe the Algorithm required to find Z-transform on circles with different radius in Z-plane or on any other contour in Z-plane. [6]
b) A digital filter with a 3 dB bandwidth of 0.25π is to be designed from analog filter whose system response is $H(s) = \Omega_c / (s + \Omega_c)$. Use bilinear transformation and obtain H (z). [4]
- Q2)**a) What do you mean by Gibb's phenomenon? What is the cause of Gibb's phenomenon? [4]
b) An FIR Filter has the unit impulse response sequence $h(n)=[2,2,-1]$. Determine the output sequence in response to input sequence $[1,2,3,-1,-2,-3,4,5,6]$ using overlap add convolution method. [6]
- Q3)** a) Explain DIT FFT radix2 algorithm with mathematical expressions. Draw butterfly diagram for same. [6]
b) Write a short note on sampling rate conversion by a rational number. [4]
- Q4)**a) Find the impulse response of an FIR filter with impulse response $h(n)=[1,2,4]$ to the input sequence $x(n)=[1,2]$. [4]
b) Explain the following windows used for designing FIR Filter. [6]
i) Rectangular window.
ii) Hamming window.
iii) Kaiser window.

P.T.O.

- Q5)** a) Draw & explain architecture of TMS 320C67XX. [6]
b) Explain the computational complexity of DFT with and without FFT. [4]
- Q6)** a) Design a 3 stage decimator that down samples an audio signal by a factor of 96 with following specifications $F_s = 96$ kHz, highest frequency of interest in data = 450Hz, $\delta_p = 0.01$, $\delta_s = 0.001$. [6]
b) What is code composer studio? Explain its use. [4]
- Q7)** a) Design a linear phase FIR low pass filter with a cut off frequency of 0.5π rad /sample by taking 11 samples of ideal frequency response. [6]
b) Explain different retiming techniques. [4]
- Q8)** a) Explain Booth's algorithm. [4]
b) Write a note on Blackfin processor. [6]



Total No. of Questions : 8]

SEAT No. :

P3975

[5155]- 227

[Total No. of Pages : 2

**M.E. (Electronics) (Digital Systems)
EMBEDDED SYSTEM DESIGN
(2013 Credit Pattern) (Semester - I) (504103)**

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

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

- Q1)** a) Compare the functional model and architectural model of an embedded system. [3]
- b) Explain the software tools i) Cross compiler ii) Linker [3]
- c) Explain the design and development life cycle model of an embedded system. [4]
- Q2)** a) With the help of suitable example explain the water fall model for the development of an embedded system. [5]
- b) Define design metrics. Explain the design challenges for optimization of design metrics. [5]
- Q3)** a) Explain the ARM floating point architecture. [4]
- b) Write a short note on 12C protocol. [3]
- c) Explain in detail memory subsystem architecture. [3]

P.T.O.

- Q4)** a) With the help of block diagram explain ARM9 5-stage pipeline organization. [4]
b) Explain Memory Protection Unit incorporated in ARM9 Processor. [3]
c) Discuss Memory interfacing with ARM9 Processor. [3]
- Q5)** a) Differentiate between BIOS and Boot-loader. [4]
b) Explain various storage considerations in Embedded Linux. [3]
c) Explain JTAG Boundary scan organization. [3]
- Q6)** a) What are different types of device drivers? Explain any one with reference to Embedded Linux. [5]
b) Explain Kernel configuration in Linux. [5]
- Q7)** a) Write short note on API with reference to Android OS. [3]
b) Write a short note on Android Telephony. [3]
c) What are the main features of Android OS. [4]
- Q8)** a) Explain in brief the architecture of Android OS. [5]
b) Explain various network service support provided by Android OS. [5]



Total No. of Questions : 8]

SEAT No. :

P3976

[5155]- 228

[Total No. of Pages : 2

**M.E. (Electronics) (Digital Systems)
RESEARCH METHODOLOGY
(2013 Pattern) (504104) (Semester - I)**

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

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

Q1) a) Which are the sources of research problem? Discuss in detail. [5]

b) Discuss the issues and trends of Research in industrial context. [5]

Q2) a) What are the characteristics of good research problem? Justify by giving few examples. [5]

b) Discuss the data collection method using digital computer system. [5]

Q3) Define and explain: [10]

- a) Research problem
- b) Research Methods
- c) Research Process
- d) Research Design

Q4) a) How to verify the performance of process system? Discuss. [5]

b) Discuss the moments and response curve methods by giving suitable example. [5]

P.T.O.

- Q5)** a) Describe modeling building and its role in Research Methodology. [5]
b) Would you consider isobars and isotheres as an analogue model of climate of country? What could be advantage of such depiction? [5]
- Q6)** a) Explain the factors that affect the choice of data, viz primary or secondary, to be used in investigation. [4]
b) Define the term Data and state its characteristics. [3]
c) Comment on whether data collected on room temperature in an office and efficiency of workers are related or not? [3]
- Q7)** a) What is regression analysis? Explain. [4]
b) What do you mean by sensitivity theory? Give its application. [3]
c) List major differences between the various types of informal experimented designs. [3]
- Q8)** Write any one research proposal of your won interest which should include the following points.
a) Project objective, significance, background. [4]
b) Impact and outreach. [3]
c) Results of Prior Kindings. [3]



Total No. of Questions :8]

SEAT No. :

P3977

[Total No. of Pages :2

[5155] - 229

M.E. (Electronics/ Digital Systems)

DESIGN FOR TESTABILITY

(2013 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer five questions.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Implement $f = \overline{w_2}w_3 + \overline{w_1}w_2\overline{w_3} + w_2\overline{w_3}w_4 + w_1\overline{w_2}w_4$ using two 3-LUTs. **[5]**

b) Consider three input majority function $f = w_1w_2 + w_1w_3 + w_2w_3$ implement using 2:1 multiplexer. **[5]**

Q2) a) Write less efficient VHDL code of priority encoder. **[5]**

b) Describe various design steps of synchronous sequential circuit. **[5]**

Q3) a) Explain control and data path in ASM. **[5]**

b) Find the hazard free minimum cost POS implementation of any arbitrary function. **[5]**

$$f(x_1, \dots, x_4) = \prod M(0, 2, 3, 7, 10) + D(5, 13, 15)$$

Q4) a) Explain the concept of static and dynamic hazards with the help of example. **[5]**

b) What is clock skew. Explain its effects on the digital circuits. How to eliminate the skew effects. **[5]**

Q5) a) Explain type FSM for serial adder. **[5]**

b) Explain State minimization technique with the help of example. **[5]**

P.T.O.

- Q6)** a) Draw the state diagram for [5]
- The machine accepts nikels and dimes.
 - It takes 15 cents for a piece of candy to be released from the machine.
 - If 20 cents is deposited, the machine will not return the change, but it will credit the buyer with 5 cents and wait for the buyer to make a second purchase.
- b) Explain the working of SRAM Cell. [5]
- Q7)** a) Explain the BIST architecture for sequential circuit. [5]
- b) Write VHDL code for comparator. [5]
- Q8)** a) Give the Pseudo code for bit counter. [5]
- b) What do you mean by design for testability? Explain its characteristics. [5]

EEE

Total No. of Questions :8]

SEAT No. :

P3978

[Total No. of Pages :2

[5155] - 230

M.E. (Electronics/ Digital Systems)

PLDs AND ASIC DESIGN

(2013 Credit Pattern) (Semester - II) (504108)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Solve any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Describe different state Assignment techniques in system design. Which is mostly preferred technique? Why? **[5]**

b) With neat sketch describe architecture of complex programmable logic device XC9500. **[5]**

Q2) a) Explain hardware and software co-design. **[5]**

b) Write a note on system on-chip. **[5]**

Q3) a) Describe the concurrent statements and sequential statements in VHDL with suitable example of each. **[5]**

b) What is a test bench? Write a test bench for 8 bit full adder. **[5]**

Q4) a) Write a VHDL code for 8 bit full adder using behavioral & structural modelling. **[5]**

b) What is a package? How to write function or procedure using package. **[5]**

Q5) a) Explain different programming technologies used to configure FPGA's. **[5]**

b) What is boundary scan testing? Explain in brief. **[5]**

P.T.O.

- Q6)** a) Write a note on Hardware - Software co-simulation. [5]
b) Classify and explain in detail Gate Array based ASIC's. [5]
- Q7)** a) Explain RTL to GDS-II flow in detail. [5]
b) Describe various ASIC design EDA Tools. [5]
- Q8)** a) Write a note on Design Rule Check (DRC) and LVS. [5]
b) Draw & explain the flow chart for ASIC design. [5]

EEE

Total No. of Questions : 8]

SEAT No. :

P3979

[5155]-231

[Total No. of Pages :2

M.E. (Electronics) (Digital System)
RANDOM SIGNALS AND PROCESSES
(2013 Credit Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat Diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

Q1) a) Define the following terms w. r. t. random processes. **[5]**

- i) Ensemble and time average.
- ii) Strict sense stationary process.
- iii) Wide-sense stationary process.
- iv) Ergodicity.

b) Explain the term power spectrums related to random processes and state its different properties. Derive the relation between autocorrelation and power density spectrum. **[5]**

Q2) a) Classify probability distributions. Explain in detail different continuous distribution functions. **[5]**

b) Let X and Y be two random variables with joint density function. **[5]**

$$f_{xy}(x, y) = \begin{cases} x^2 + \frac{xy}{3}, & 0 \leq x \leq 1 \text{ and } 0 \leq y \leq 2 \\ 0, & \text{otherwise} \end{cases}$$

- i) Check that $f_{xy}(x, y)$ is a density function.
- ii) Find the marginal density functions $f_x(x)$ and $f_y(y)$.

Q3) a) Define and explain in detail Binary hypothesis test in detection of signals. **[5]**

b) State and explain Cramer – Rao inequality. **[3]**

c) What is need of an Estimator. **[2]**

P.T.O.

- Q4)** a) Define four properties of joint density function. [5]
 b) i) Find the constant c such that the function. [5]

$$f_x(x) = \begin{cases} c x & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$$

Is a density function.

- ii) Compute $P(1 < X < 2)$.
 iii) Find the distribution function $F_x(x)$.
- Q5)** a) Compare MMSE and MAP estimators with respect to accuracy and complexity. [5]
 b) Consider the random variable X with mean value 3 and variance 2. A second random variable Y is defined as $Y = 3X - 11$. Find the mean value of Y and the correlation of X and Y. [5]

- Q6)** a) Define central moments, skew and kurtosis for a random variables. [5]
 b) A box contains 10 black balls and 15 white balls. One ball at a time is drawn, its color is noted and the ball is replaced in the box for the next draw: [5]
 i) Find the probability that the first white ball is drawn on the third draw.
 ii) Find the probability that the second and third white balls are drawn on the fifth and eighth draws respectively.

- Q7)** a) Write a note on central limit theorem. [5]
 b) What are moment generating functions and characteristic functions. Explain their importance. [5]

- Q8)** a) Describe the important properties of autocorrelation and cross correlation. [5]
 b) A random process has sample functions of the form. [5]

$$X(t) = A \sin(\omega t + \theta)$$

Where A and θ are statistically independent random variables and the frequency is constant. The random variable A is uniformly distributed from 0 to 10, and the random variable θ is uniformly distributed 0 to π . Is this process wide-sense stationary?



Total No. of Questions : 8]

SEAT No. :

P3980

[5155]- 232

[Total No. of Pages : 2

**M.E. (Electronics)
DIGITAL SYSTEM**

**Image Processing and Computer Vision
(2013 Pattern) (Semester - III)**

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any 5 questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

Q1) a) Explain the following terms **[5]**

- i) Bit Slicing & Gray level Slicing
- ii) 4-connectivity
- iii) Euclidean Distance
- iv) Spatial Resolution

b) Define gradient vector? Explain the gradient operators such as Robert's cross gradient, sobel operator, Prewitt operator. **[5]**

Q2) a) Using 3×3 mask, compute median value of the underlined pixels **[5]**

18	22	33	25	32	24
34	<u>128</u>	<u>24</u>	<u>172</u>	<u>26</u>	23
22	19	32	31	28	26

b) Explain the significance of histogram equalization techniques and states its steps in detail. **[5]**

P.T.O.

- Q3)** a) Explain the use of second derivative? Why zero crossing is detected instead of peaks in case of log operator. [5]
- b) What are the different stages of canny edge detector? Briefly explain each phase. [5]
- Q4)** a) Compute Discrete cosine transform for $N = 4$. [5]
- b) Write a note on discrete wavelet transform. [5]
- Q5)** a) Describe the principle of 2D view based on 3D scene. [5]
- b) Describe the intrinsic and extrinsic parameters of single perspective camera. [5]
- Q6)** a) Explain the following applications of epipolar geometry in 3D vision [5]
- i) 3D reconstruction from two camera (Calibrated)
- ii) Image rectification for search of correspondence.
- b) Explain the stereo correspondence algorithm. How depth acquisition is possible. [5]
- Q7)** a) Explain with a proper ray diagram the single perspective camera with its co-ordinate system. [5]
- b) Explain The geometry of two cameras with reference to fundamental matrix. [5]
- Q8)** a) Explain the pixel matching technique using stereo vision system. Define the matching parameters. [5]
- b) With reference of Radiometry and 3D vision explain photometric stereo in 3D vision . [5]



Total No. of Questions : 8]

SEAT No. :

P3981

[5155]-233

[Total No. of Pages :2

M.E. (Electronics) (Digital System)
WIRELESS AND MOBILE TECHNOLOGIES
(2013 Credit Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) Explain the different types of small-scale fading. **[6]**
- b) Illustrate the concept of cellular frequency reuse with the help of figure. Explain the method of locating co-channel cells in a cellular system with suitable example. **[4]**
- Q2)** a) State and explain the various techniques used to improve coverage and capacity in cellular systems. **[6]**
- b) Explain the doppler shift with the help of diagram. Derive the expression for the doppler shift. **[4]**
- Q3)** a) Explain the problem of hidden and exposed terminals. Also explain near for effect. **[4]**
- b) Explain how a multiple access collision avoidance can avoid the problem of hidden terminal and exposed terminal. **[6]**
- Q4)** a) What are the benefits of reservation schemes? How are the collisions avoided during data transmission, why is the probability of collisions lower compared to classical aloha. **[6]**
- b) Compare CDMA and TDMA mechanism. **[4]**

P.T.O.

- Q5)** a) List the requirements for mobile IP and justify them. [4]
b) List the entition of mobile IP and describe data transfer from a mobile node to a fixed node and vice-versa. [6]
- Q6)** a) Explain mobile TCP. State its advantages. [4]
b) Explain indirect TCP. State its advantages. [4]
c) Compare destination sequence vector with distance vector algorithm. [2]
- Q7)** a) State and explain four possible scenarios in GSM with the help of figure. [4]
b) Explain GSM structuring of time using a frame hierarchy with figure.[3]
c) Explain in brief the security services offered by GSM. [3]
- Q8)** a) Explain in brief the three versions of a PHY layer defined in IEEE 802.11 standard. [6]
b) Explain channel access cycle in the HIPERLAN 1 with the help of neat diagram. [4]



Total No. of Questions : 8]

SEAT No. :

P3982

[Total No. of Pages : 2

[5155]-234

**M.E. (Electronics and Telecommunication) (Semester - I)
MODELING & SIMULATION OF COMMUNICATION
NETWORKS
(2013 Pattern)**

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) All questions carry equal marks.*
- 2) Solve any five questions.*
- 3) Assume suitable data wherever necessary.*
- 4) Your answer as whole will be given weightage.*

- Q1)** a) Explain the various aspects of methodology used in the simulation of digital communication system. **[5]**
- b) Why the selection of simulation sampling frequency is so critical in the analysis of any communication systems? **[5]**
- Q2)** a) Describe in brief how approximations and assumptions are used to simplify the simulation model of BPSK system. **[5]**
- b) Using simulation model, how the BER of typical digital communication system is estimated. **[5]**
- Q3)** a) Design a mixed congruence generator having period $m=5000$ **[5]**
- b) Explain how Durbin Watson test is used to check the randomness of the given sequence. **[5]**
- Q4)** a) How does the uniform random variables are mapped to an arbitrary pdf using inverse transform method. **[5]**
- b) What is the need of PN sequence generator in digital communication system? Explain PN sequence generator with a suitable sketch. **[5]**

P.T.O

- Q5)** a) Define the following terms with respect to Monte Carlo simulation [5]
i) Relative frequency
ii) Biased and unbiased estimators
- b) Write an algorithm for the Monte Carlo simulation of Binary phase shift keying in the presence of Additive white Gaussian Noise (AWGN). Assume that data symbols at the source output are independent and equiprobable. [5]
- Q6)** a) Semi analytic techniques are superior over Monte Carlo method in the field of simulation. Why? [5]
- b) What are the various specifications to be considered with respect to the simulation of multi path fading channel in a wireless communication system. [5]
- Q7)** a) How pdf estimators are used to overcome the long run time requirements of Monte Carlo method. [5]
- b) Why Markov models are so popular for discrete channels with memory. Explain two state Markov model. [5]
- Q8)** a) What is tapped delay line model for linear time invariant system and explain how various tap gains are generated. [5]
- b) Write short note on: [5]
i) Empirical models based on swept tone measurements
ii) Factors to be considered for the simulation of nonlinearities



Total No. of Questions : 8]

SEAT No. :

P3983

[Total No. of Pages : 2

[5155]-235
M.E. (E & TC)
COMMUNICATION NETWORKS
Spread Spectrum & CDMA Systems
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any 5 questions.*
- 2) *Assume suitable data, if necessary.*
- 3) *Figure to the right indicates full marks.*
- 4) *Use of calculator is allowed.*

- Q1)** a) Find the output of High speed linear feedback shift register generator with $g(D) = 1+D+D^3+D^4$ and an initial shift register load of 0001. [5]
- b) Write short notes on non-linear code generators. [5]
- Q2)** a) Explain the block diagram of Direct spread spectrum receiver using Matched-filter code acquisition. [6]
- b) State the properties of maximal length sequences. [4]
- Q3)** a) Explain the performance of coherent direct sequence spread spectrum system in partial band jamming. [6]
- b) Describe spread spectrum communication system model. [4]
- Q4)** a) Explain time selective fading channel with its mathematical expressions. [4]
- b) Write short note on Reed Solomon codes. [4]
- c) What is Gold Code? [2]

P.T.O

- Q5)** a) Discuss various handoff mechanisms in CDMA Technology. [4]
b) State specifications for WCDMA Technology. [4]
c) Enlist the various performance parameters of digital Cellular systems. [2]
- Q6)** a) Explain the architecture of CDMA 2000 system. [5]
b) Explain the developments for IS 95 to 3G CDMA Technologies. [5]
- Q7)** a) Explain the terms in brief:
i) Power control and soft handoff
ii) Medium Access in WCDMA [6]
b) Discuss system Capacity and important features for CDMA Technology. [4]
- Q8)** a) Discuss with necessary diagram, RAKE receiver used in CDMA Technology. [5]
b) Explain use of CDMA technology in GPS receiver. [5]



Total No. of Questions : 8]

SEAT No. :

P3984

[Total No. of Pages : 3

[5155]-236

M.E. (E&TC)(Communication Network)

DETECTION AND ESTIMATION THEORY

(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

Q1) a) Explain in brief various components of a decision theory problem. [4]

b) Derive an expression for likelihood ratio for binary Hypothesis. [4]

c) Draw the diagram of M-hypothesis problem. [2]

Q2) a) In a communication system, consider a source whose output under hypothesis H_1 is a constant voltage of value " ν " while its output under H_0 is zero. The received signal is corrupted by N , an additive white Gaussian noise of zero mean and variance σ^2 . set up the likelihood ratio test and determine the decision regions. [4]

b) Explain with neat block diagram, the working principle of CFAR detection. [4]

c) Explain in brief the estimation model. [2]

Q3) a) List out various properties of integral equations. [4]

b) Explain with neat diagram, the working operation of optimum filter. [4]

c) Brief two properties of eigen function and eigen values. [2]

Q4) a) With neat diagrams, describe the working operation of modulation system with memory. [4]

P.T.O

- b) Describe with neat block diagram, the working operation of multilevel modulation system. [4]
- c) Explain the significance of lower bound on mean square estimation error. [2]

Q5) a) Derive an expression for risk function of minimum mean square estimator. [5]

- b) Find the value of mean square estimator \hat{m} ms of the following observed samples:

$P_k = M + NK$, $k = 1, 2, 3, \dots, K$, M and NK are statistically independent gaussian r.v with zero mean and variance σ^2 . [5]

Q6) a) With the help of example and mathematical expression explain the working principle of matched filter receiver. [4]

- b) Describe in detail with diagram and expression the AR processes. [4]
- c) Brief the fundamental role of optimum linear filters. [2]

Q7) a) Classify estimation method. Explain in brief: [5]

- i) Invariance property
- ii) Criteria for good estimators

- b) Obtain the generalized likelihood ratio test and compare it to the optimum Neyman Pearson test, for the situation where the observations under each hypothesis are given by: [5]

$$H_1 : y = m + N$$

$$H_0 : y = N$$

Where N is a white gaussian noise of zero mean and variance σ^2 and m is unknown.

- Q8)** a) Explain in detail the working of optimum unrealizable filter. [4]
- b) Determine the minimum mean square error using a method of interpolation to estimate $Y(t)$ in the interval $t \in \{0, T\}$ given $y(0)$ and $y(T)$. [4]
- c) Explain in brief the significance of weiner filters. [2]



Total No. of Questions : 8]

SEAT No. :

P3985

[Total No. of Pages : 2

[5155]-237

M.E. (Electronics & Telecommunication) (Semester - II)

COMMUNICATION NETWORK

Traffic Analysis and QoS

(2013 Course)

Time : 3 Hours]

[Maximum Marks : 50

Instructions:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of calculator is allowed.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Explain Link Level flow & Error control? [4]
b) Define & explain optical and MAN feeder Networks? [4]
c) What are the network management standards? [2]
- Q2)** a) Explain congestion control in ATM networks? [4]
b) Explain conceptual Model for Telecommunication network? [4]
c) Describe TMN information Architecture with neat diagram? [2]
- Q3)** a) With neat diagram explain communication model in detail? [4]
b) What is the SDH management? Also explain Broadband Network Management? [4]
c) Define & explain TMN? [2]
- Q4)** a) Define & explain the system utility for management? [4]
b) Write the short note on MPLS Traffic Engineering? [4]
c) Prepare a chart for functional roll of management tools? [2]

P.T.O

- Q5)** a) Write short note on integrated services? [4]
b) Explain High speed LAN performance, modeling & its estimation? [4]
c) Explain QoS parameters define by ATM forum? [2]
- Q6)** a) Explain OAM management & MPLS operation? [4]
b) What are the policies used for TCP implementation? [4]
c) What are service categories define by ATM forum? [2]
- Q7)** a) Define congestion & explain mechanism for congestion control? [4]
b) With neat diagram explain network management system? [4]
c) Explain Cell Delay Variation? [2]
- Q8)** a) Explain Organization model? [4]
b) Explain MIB Engineering? [4]
c) What is the requirement of Fiber channel? [2]



Total No. of Questions : 8]

SEAT No. :

P3986

[Total No. of Pages : 2

[5155]-238

M.E. (E&TC)(Communication Networks) (Semester - II)
Broadband Wireless Technologies
(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) Explain working of OFDM system with a suitable block diagram. Also indicate need of cyclic prefix and guard interval. How orthogonality is achieved in OFDM system? [5]
- b) Discuss frequency selective fading channel in wireless communication system. [5]
- Q2)** a) What are the different diversity techniques? When space time coding is used? Hence explain Alamouti codes and its properties. [5]
- b) Explain the concept of Multiple input multiple output OFDM transmitter and receiver. [5]
- Q3)** a) Compare and contrast time hopping UWB system for single class traffic with continuous transmission and Multiple-time-hopping PPM UWB system with variable bit rate transmission. [5]
- b) Differentiate between polling MAC and Reservation MAC. [5]

P.T.O

- Q4)** a) Explain the working of Carrier Sense Multiple Access with collision avoidance MAC. [5]
b) Explain directional antenna MAC with necessary schematic. [5]
- Q5)** a) What is the importance of routing protocols in multi-hop networks? [4]
b) Compare WiMAX and Wi-Fi technology. [4]
c) Explain multi-hop network with respect to multiple cells. [2]
- Q6)** a) Compare and contrast Adaptive Routing Protocol and Scalable Routing protocol. [5]
b) Explain in brief the types of routing matrices. [5]
- Q7)** a) Explain different techniques to mitigate the bandwidth management for Multichannel EPONs. [5]
b) Discuss different architectural consideration for deployment of point to point FTTX. [5]
- Q8)** Write a short note on [10]
a) Local admission control (LAC)
b) Global admission control (GAC)



Total No. of Questions : 8]

SEAT No. :

P3991

[Total No. of Pages : 2

[5155]-239

M.E. (E&TC)(Communication Networks) (Semester - II)

OPTICAL NETWORKS

(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable the data if necessary.*
- 4) *Use of calculator is allowed.*

Q1) a) Explain the telecommunication network architecture in brief. [6]

b) Write short note on Isolators and circulators. [4]

Q2) a) Explain the following terms in detail. [4]

i) Crosstalk

ii) Design considerations of optical Transmitter

b) Explain in detail nonlinear effects of optical networks [6]

Q3) a) Describe the second generation optical networks and state its advantages [5]

b) Explain concept of digital wrapper. Give its applications. [5]

Q4) a) What is the difference between in band and out of band control signaling? [5]

b) Explain the different types of optical couplers and switches in brief. State the specifications of any two. [5]

P.T.O

- Q5)** a) Describe the digital wrapper in detail. State its advantages and applications. [5]
b) Explain the bidirectional line switched ring topology. State its limitations. [5]
- Q6)** a) Describe the OTN layered model in detail. [4]
b) write short note on the following (any two): [6]
i) GFP
ii) FEC
iii) Passive optical networks
- Q7)** a) Describe the wavelength converters and metro optical networks. [4]
b) What is Add-Drop Multiplexer? State its advantages, disadvantages and applications. [6]
- Q8)** a) Explain the significance of SONET and SDH in optical networks. [4]
b) Write short notes on the following: (any two) [6]
i) Label distribution and binding
ii) WDM and DWDM
iii) Robust optical network



Total No. of Questions : 8]

SEAT No. :

P3992

[Total No. of Pages : 2

[5155]-240

M.E. (E&TC)(Communication Network) (Semester - III)

MOBILE COMPUTING

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five questions out of Q.1 to Q. 8.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Assume suitable data if necessary.*

Q1) a) Discuss the case studies of secure mobile application development. **[5]**

b) Discuss Bluetooth and its protocol stack. **[5]**

Q2) a) Explain dynamic channel allocation. **[5]**

b) Discuss 3G mobile telephone technology. **[5]**

Q3) a) Explain in detail concept of WLL. **[4]**

b) Explain 4G mobile telephone technology. **[4]**

c) Write a short note on: MIMO **[2]**

Q4) a) How can IP help to transfer multiple data. **[4]**

b) Explain VOIP architecture. **[4]**

c) Write a note on CDMA. **[2]**

Q5) a) Discuss in details H.323. **[4]**

b) Explain various security models used in mobile computing. **[4]**

c) Discuss in detail about wi-max technology. **[2]**

P.T.O

- Q6)** a) Explain the various types of mobilities used in mobile computing environment? [4]
- b) What are the fundamentals of wireless markup language WML script application. [4]
- c) Discuss various service applications of GPRS. [2]
- Q7)** a) Discuss wireless LAN architecture. [4]
- b) What is handoff? What is roaming? How do you performing handoff during roaming? [4]
- c) What is Low-power wireless data system. [2]
- Q8)** a) Explain in details 4 GLTE network architecture and discuss different entities used. [4]
- b) Explain how the GSM system can be enhanced to use of GPRS system. [4]
- c) Compare and contrast multiple access techniques. [2]



Total No. of Questions : 8]

SEAT No. :

P3993

[Total No. of Pages : 3

[5155]-241

M.E. (E&TC)(Communication Networks) (Semester - III)

DIGITAL COMMUNICATION RECEIVERS

(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) Answer any five questions out of 8.
- 2) Neat diagrams and waveforms must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Determine whether or not $s_1(t)$ and $s_2(t)$ are orthogonal over the interval $(-1.5 T_2 < t < 1.5 T_2)$ Where **[5]**

$s_1(t) = \cos(2\pi f_1 t + \phi_1)$, $s_2(t) = \cos(2\pi f_2 t + \phi_2)$, and $f_2 = 1/T_2$ for the following cases.

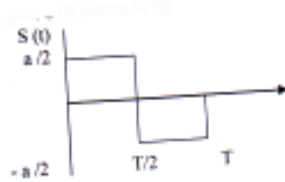
- i) $f_1 = f_2$ and $\phi_1 = \phi_2$
 - ii) $f_1 = 1/3 f_2$ and $\phi_1 = \phi_2$
 - iii) $f_1 = 2 f_2$ and $\phi_1 = \phi_2$
 - iv) $f_1 = \pi f_2$ and $\phi_1 = \phi_2$
 - v) $f_1 = f_2$ and $\phi_1 = \phi_2 + \pi$
- b) Describe in detail the two fair ways of comparing different curves that depict bit-error probability versus E_b/N_0 . **[5]**

Q2) a) Draw signal space and spectral diagram of 16 QAM, 16-ary PSK, QPSK and MSK digital CW modulation and state the bandwidth requirement. **[5]**

P.T.O

- b) Binary data is transmitted using PSK at a rate 3 Mbps over RF link having bandwidth 10 MHz. Find signal power required at receiver input so that error probability is less than or equal to 10^{-4} . Assume noise PSD to be 10^{-10} watt/Hz. ($Q(3.71) = 10^{-4}$). [5]

- Q3)** a) What is Correlator? Compare its performance with matched filter mathematically and relevant diagrams. [5]
 b) Consider the signal $S(t)$ shown in fig [5]



Determine the impulse response of a filter matched to this signal and sketch it as a function of time, Plot the matched filter output as a function of time.

- Q4)** a) Explain how the probability of error is reduced by using Envelope detection for correlated binary signal. [5]
 b) Explain the Maximum a posteriori probability rule (MAP) and Maximum Likelihood Rule (ML) for receiver. What is difference between them. [5]

- Q5)** a) For each of the fading-effect categories below, name an application that generally fits that category. Provide numerical justification. [5]
 i) Frequency-selective, fast-fading
 ii) Frequency-selective, slow-fading
 iii) Flat-fading, fast-fading
 iv) Flat-fading, slow-fading
 b) What is a synchronizer? Explain any one type of bit synchronizer. [5]

- Q6)** a) What are the statistical models for multipath fading channels? Explain them. [5]
b) What is small scale fading? Explain the factors influencing small scale fading. [5]
- Q7)** a) Explain Blind Equalization based on Maximum Likelihood Criteria. [5]
b) Explain Non-Decision-directed PLL for carrier phase estimation of PAM signals. [5]
- Q8)** With reference to Adaptive Equalization briefly describe. [10]
a) Zero forcing algorithm
b) LMS algorithm
c) Adaptive decision-feedback equalizer
d) Kalman algorithm



Total No. of Questions : 3]

SEAT No. :

P3994

[Total No. of Pages : 3

[5155]-242

M.E. (E&TC)(Microwave) (Semester - I)
ELECTROMAGNETICS AND ANTENNA THEORY
(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

Q1) Explain the following terminologies with reference to Uniform plane waves with illustrative diagrams, mathematical expressions and significance of each.

[10]

- i) TEM
- ii) Propagation constant, attenuation and phase constant
- iii) Skin depth, loss tangent
- iv) Reflection coefficient, VSWR, Return Loss
- v) Intrinsic impedance, phase velocity

Q2) a) The radial component of the radiated power density of an antenna is

given by $\bar{W}_{\text{rad}} = A_0 \frac{\sin}{r^2} \hat{a}_r \text{ W/m}^2$ determine the radiation intensity and total radiated power. **[3]**

- b) Explain the field equivalence principle and its applications in antenna analysis with suitable example and relevant mathematical expressions. **[4]**
- c) Derive the Laplace equation and explain its application in solving the electromagnetic problem taking a suitable example. **[3]**

P.T.O

- Q3)** a) Explain the Poynting theorem in detail with relevant expressions. [4]
 b) In a nonmagnetic medium. [6]

$$\vec{E} = 100 \sin(2\pi \times 10^9 t - 0.25x) \hat{a}_z \text{ V/m}$$
 find (a) ϵ_r η (b) The time – average power carried by the wave.
- Q4)** a) Explain the various analysis techniques for Micro strip Antenna with illustrative diagrams. [6]
 b) Draw the equivalent circuits for the following feeds for Microstrip antenna with justification, explain the advantages and disadvantages of these methods. [4]
 i) Microstrip line
 ii) Probe
 iii) Aperture coupled
 iv) Proximity coupled
- Q5)** a) Design a circular microstrip antenna using a substrate (RT/duroid 5880) with a dielectric constant of 2.2, $h=0.1588\text{cm}$ so as to resonate at 10GHz. [6]
 b) Compare the rectangular and circular Microstrip antennas in terms of radiation pattern, polarization, bandwidth, gain and directivity. [4]
- Q6)** Define the current distribution for a small current element ($\lambda / 50 \leq l \leq \lambda / 10$), derive the far field electric and magnetic field equations, also radiated power and radiation resistance. [10]
- Q7)** a) Describe the Helical antenna with illustrative diagram with all the dimension details, sketch its typical radiation pattern, and explain its various modes of operation. [4]

- b) Explain various feed systems in parabolic reflector with illustrative diagrams, explain Cassegrain feed in detail. [3]
- c) Derive the array factor of N element Linear array of two infinitesimal dipoles and explain the principle of pattern multiplication. [3]
- Q8)** a) Explain the continuity equation and its significance [2]
- b) Write the design equations of Pyramidal Horn antenna. [2]
- c) Write the detailed specifications of Parabolic reflector. [2]
- d) Sketch the radiation pattern of Yagi Uda and Spiral Antenna. [2]
- e) Explain the polarization and input impedance of the antenna and their significance. [2]



Total No. of Questions :8]

SEAT No. :

P3995

[Total No. of Pages : 3

[5155]-243

M.E. (E&TC)(Microwave) (Semester - I)
RF AND MICROWAVE CIRCUITS (RFMC)
(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Solve any five questions.*
- 2) *Figures to the right indicates full marks.*
- 3) *Assume suitable data if wherever necessary.*

Q1) a) Four different load impedances:

- | | |
|------------------------------|----------------------------|
| i) $Z_L = 50 \Omega$ | ii) $Z_L = 48.5 \Omega$ |
| iii) $Z_L = (75+j25) \Omega$ | iv) $Z_L = (10-j5) \Omega$ |

are sequentially connected to a 50Ω transmission line. find the reflection coefficients and the SWR circles. Also find return loss in dB. [5]

b) Derive the expression for propagation constant, Impedance and power flow for the lossless co-axial line. [5]

Q2) a) Draw the layout diagram and the equivalent circuit of the following microstrip components. [10]

- a) A hybrid or Rat-race in microstrip form.
- b) An equivalent split wilkinson power divider.
- c) A quadrature (90°) hybrid branch line coupler.

Q3) a) Explain the significance of [5]

- i) Sensitivity
- ii) Dynamic range

P.T.O

- b) Write a note on random process and sources of noise in microwave circuits. [5]
- Q4)** a) Explain the concept of intersymbol interference. How ISI affects the wireless communication. [5]
- b) Write a note on Microwave filters. [5]
- Q5)** a) Explain the working principle of [5]
- i) HEMT
- ii) Transferred electron devices (TEDs)
- b) Write note on varactor diode. [5]
- Q6)** a) A MOSFET operated at 5.7 GHz has the following S-parameters: $S_{11} = 0.5 \angle -60^\circ$, $S_{12} = 0.02 \angle 0^\circ$,
 $S_{21} = 6.5 \angle 115^\circ$, $S_{22} = 0.6 \angle -35^\circ$,
- i) Determine if the circuit is unconditionally stable.
- ii) Find the maximum power gain under optimal choice of the reflection coefficient assuming the unilateral design. [5]
- b) Explain in detail TRA PATT devices. [5]
- Q7)** a) Explain the concept of impedance matching related to amplifier design. [5]
- b) Design a BJT colpitts Oscillator for 200 MHz in common emitter configuration having bias point of $V_{ce} = 3$ volt, $I_c = 3$ mA. following circuit parameters are given at room temperature of 25°C.
 $C_{BC} = 0.1$ pF, $r_B = 2k\Omega$, $r_{CE} = 10k\Omega$, $C_{BE} = 10$ pF.
 If the inductance should not exceed $L_3 = L = 5_nH$, find the values for capacitances in feedback loop. [5]

Q8) 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 $V_s = 5\text{V}$ and source impedance $Z_s = 40\ \Omega$. 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.

- a) Transducer gain G_T , unilateral transducer gain G_{TU} , available gain G_A , operating power gain G and
- b) Power delivered to the load P_L , available power P_A and incident power to the amplifier. **[10]**



Total No. of Questions : 6]

SEAT No. :

P3996

[Total No. of Pages : 2

[5155]-244
M.E. (E&TC)(Microwave)
MICROWAVE MEASUREMENT
(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Assume suitable data, if necessary.*

Q1) a) State and explain the properties of transmission lines. **[5]**

b) Define propagation constant, impedance and power flow for the lossless co-axial lines. **[5]**

Q2) a) What are the scattering parameters with respect to conjugate matching. **[5]**

b) Explain the concept of Lossless networks. **[5]**

Q3) a) Prove that voltage standing wave ratio at the input part is $S_{11} = \frac{1+|S_{11}|}{1-|S_{11}|}$ **[5]**

b) Draw and explain the basic principle of insertion loss. **[5]**

Q4) a) State the types of noise sources and explain any one in detail. **[5]**

b) Explain the automated noise measurement techniques. **[5]**

P.T.O

Q5) a) Draw the block schematic of Network analyzer and explain the application of Network analyzer. **[5]**

b) What is the basic working principle of spectrum analyzer. **[5]**

Q6) Write short notes on: **[10]**

a) Power sensors

b) Couplers of reflectometers



Total No. of Questions : 8]

SEAT No. :

P3997

[Total No. of Pages : 2

[5155]-245

**M.E. (E&TC)(Microwave) (Semester - II)
COMPUTATIONAL ELECTROMAGNETICS
(2013 Pattern)**

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions.*
- 2) Neat diagram must be drawn whenever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data if necessary.*

Q1) a) Derive Green's function corresponding to PDE for free space. **[5]**

b) Explain overview of various computational methods. **[5]**

Q2) a) Compare FDM and FDTD modeling techniques. **[5]**

b) Explain applications of one dimensional FDTD analysis. **[5]**

Q3) Explain in detail Green's function for two dimensional case. **[10]**

Q4) a) Explain Ritz variational method. **[5]**

b) Explain advances in FDTD technique. **[5]**

Q5) a) Explain in detail method of weighted residual. **[5]**

b) Explain the applications of Ritz variational method. **[5]**

Q6) Compare FDM, FDTD, FEM and MOM modeling techniques. **[10]**

P.T.O

Q7) a) Explain Galerkins method. **[5]**

b) Explain point matching method. **[5]**

Q8) Write short note on **[10]**

i) Band Matrix method

ii) Iteration method



Total No. of Questions : 8]

SEAT No. :

P3998

[Total No. of Pages : 2

[5155]-246

M.E. (E&TC)(Microwave) (Semester - II)

RF AND MMIC TECHNOLOGY

(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Neat diagram 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.*

Q1) Discuss in details three important design approaches adopted for the design of MMICs and compare them. **[13]**

OR

- Q2)** a) State the advantages and disadvantages of MMICs in comparison with hybrid MICs. **[6]**
b) Write a short note on design of HBT and the related parameters. **[7]**

- Q3)** a) What is mean by synthesis of MIC? Explain need of matrix representation for MMICs. **[6]**
b) Enlist various methods available for synthesis of non-linear MMICs. Explain one of the methods in detail. **[7]**

OR

Q4) Describe in detail the convolutional and transient analysis techniques used for simulation of the circuits. **[13]**

Q5) Explain the different CAD design features and their use in MMICS design. **[12]**

OR

Q6) Enlist CAD techniques used for MMIC design. Explain the design of phase shifters. **[12]**

P.T.O

- Q7)** a) Explain network matrix decomposition of microwave circuits. [6]
b) Describe micro-grounding microstrip lines with via holes. [6]

OR

- Q8)** a) Draw and explain complete MMIC design cycle. [6]
b) Write short note on MMIC test system. [6]



Total No. of Questions : 8]

SEAT No. :

P3999

[Total No. of Pages : 3

[5155]-247

**M.E. (E&TC) (Microwave) (Semester - II)
WIRELESS COMMUNICATION SYSTEM
(2013 Pattern)**

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) Describe the 1G, 2G, 3G cellular systems with features, supporting services, technologies with numerical figures. [5]
- b) Determine the frequency reuse distance for a cell radius of 5km and cluster size of 4. [3]
- c) Explain the GSM service request operation with relevant diagrams. [2]
- Q2)** a) Derive the equation for received power in free space propagation model. [4]
- b) Derive the equation for received power in two ray ground reflection propagation model. [4]
- c) Define fading, fast and slow fading. [2]
- Q3)** a) If a certain CDMA radio base station system can output a 50w carrier signal, how much power is on the synchronization channel. [3]
- b) What are the various frame formats used in GSM traffic, describe each of them with relevant diagrams and numerical figures. [5]
- c) Explain the intra BSC handover in GSM. [2]

P.T.O

- Q4) a)** Explain the following in brief with reference to CDMA. **[10]**
- i) Soft Hand off
 - ii) Hard hand off
 - iii) Access channel probing
 - iv) FHSS
 - v) DSS

- Q5) a)** What are the small scale effects of multipath? Consider a stationary transmitter which radiates a sinusoidal carrier frequency of 1850 MHz. For a vehicle carrying a mobile receiver moving at 96kmph, compute the received carrier frequency if the vehicle is moving. **[5]**
- i) Directly towards the Transmitter
 - ii) Directly away from the transmitter
 - iii) In a direction which is perpendicular to the direction of arrival of transmitter signal.
- b) Explain the cost 231 path loss model with all the expressions and also mention the assumptions and applications. **[5]**

- Q6) a)** Write a short note on the following with reference to UMTS **[6]**
- i) UTRAN
 - ii) GGSN
 - iii) HLR
- b) In order to determine voice traffic on a line, data has been collected during a period of 90 minutes as given in following table. Calculate the traffic intensity in Erlangs and CCS. **[4]**

Call No.	1	2	3	4	5	6	7	8	9	10
Duration	90	16	70	80	92	48	126	70	64	96

- Q7) a)** What is probability model that describes the smooth traffic and write the distribution and explain in detail. **[3]**
- b) Derive that the $\frac{D}{R} = \sqrt{3N}$ from the basic Hexagonal Cell Geometry. **[5]**
- c) Explain the terms Doppler shift and ISI with reference to the wireless channel. **[2]**

- Q8)** a) How do you increase the signal to co channel interference ratio by cell splitting and cell sectoring without decreasing the capacity? Explain with relevant diagrams and mathematical expressions. **[4]**
- b) Explain the functions of MAC Layer and Radio Link control protocol of UMTS in detail. **[4]**
- c) What are the projected features of the wireless standards beyond 3G. **[2]**



Total No. of Questions : 6]

SEAT No. :

P4000

[Total No. of Pages : 2

[5155]-248
M.E. (E&TC)(Microwave)
EMI AND EMC TECHNIQUES
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.*
- 2) Neat diagram must be drawn wherever necessary.*
- 3) Use of electronics pocket calculator is allowed.*
- 4) Assume suitable data if necessary.*
- 5) Figures to the right indicates full marks.*

- Q1)** a) Explain different types of EMI suppression techniques? **[4]**
- b) What are some basic EMI test categories and their associated test requirement? Why should EMI/EMC test to be done at certified laboratory? **[4]**
- c) With practical example compare conducted, radiated and transient EMI. **[2]**
- Q2)** a) Draw and explain general flow diagram used for prediction and solving of EMI problem. **[4]**
- b) Explain in detail propagation model for amplitude culling. **[4]**
- c) What is difference between inter system EMI and intra system EMI? **[2]**
- Q3)** a) How to measure the common mode and differential mode interference voltages? **[4]**
- b) Give the design guidelines for RF transmitter and receiver system for minimization of EMI? **[4]**
- c) State the multilevel EMI prediction process in detail. **[2]**

P.T.O

- Q4)** a) Explain the factors which influence on site attenuation and normalized site attenuation. [4]
b) Explain the different types of filters used in EMI for insertion loss? [4]
c) Differentiate between grounding and shielding. [2]
- Q5)** a) Explain the operation of common mode choke. [5]
b) Explain single point, multi point and hybrid grounding techniques. [5]
- Q6)** a) Explain design of telephone line filter and its characteristics. [5]
b) Explain federal communication commission and CISPR/IEC standards. [5]



Total No. of Questions : 8]

SEAT No. :

P4001

[Total No. of Pages : 2

[5155]-249

M.E. (E&TC)(Microwave) (Semester - III)
RADAR & SATELLITE COMMUNICATIONS
(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Solve any five questions.*
- 2) *Neat diagram must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain the basic principles of a radar system with neat block diagram. Give the limitations and applications of radars. **[6]**

b) Derive the radar range equation? Explain the factors that affect the maximum range of radar. **[4]**

Q2) a) Explain with neat block diagram the working principle of Moving Target Indicator (MTI) radar. **[5]**

b) Explain basic principle of Pulsed radar system. **[5]**

Q3) a) Write short notes on: **[4]**

- i) Blind speeds
- ii) Continuous Wave Radar

b) Discuss the ambiguity in radar range equation. **[3]**

c) Explain how the radar is used in remote sensing. **[3]**

Q4) a) Explain the concept of Correlation and Convolution with respect to radars. **[6]**

b) Explain the Doppler effect in Radar system. **[4]**

P.T.O

- Q5)** a) With respect to satellite communication explain the following multiple access techniques. [4]
- i) SDMA
 - ii) Random Access
- b) Explain with neat block diagram concept of TTC & M in satellite communication. [6]
- Q6)** a) Comment on various interferences and noise sources in satellite communication system. [4]
- b) Explain in brief the concept of link design for Geostationary satellites. [6]
- Q7)** a) Which conditions should be fulfilled to attain a geostationary orbit? [2]
- b) Explain various advantages & limitations of satellite communication? [4]
- c) Define elevation & inclination angles along with their significance. [4]
- Q8)** a) What are the primary factors needed for defining an orbit of a satellite? [4]
- b) What is antenna misalignment loss? Propose a solution to overcome these losses. [3]
- c) Discuss the design considerations of a communication satellite. [3]



Total No. of Questions : 8]

SEAT No. :

P4002

[Total No. of Pages : 2

[5155]-250
M.E. (E&TC) (Signal Processing)
IMAGE PROCESSING & ANALYSIS
(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) Answer any 5 questions .*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) All questions carry equal marks.*
- 5) Your answers will be valued as a whole.*
- 6) Use of logarithmic tables slide rule, Molier charts, electronic pocket calculator and steam tables is allowed.*
- 7) Assume suitable data, if necessary.*

- Q1)** a) What is homomorphic filtering? Derive the filter function for homomorphic filter. **[6]**
- b) What is meant by image quantisation? What is relation between number of pixel and resolution? **[4]**
- Q2)** a) How is image averaging different from image zooming. Give reason why median filtering is effective in removal of salt and pepper noise. **[6]**
- b) Explain basis of spatial filtering using a filter mask convolution. **[4]**
- Q3)** a) An 8 bit input image has to be enhanced by stretching gray level range [96, 169] by a factor of 2. The remaining gray levels observe identity transformation. Draw the gray level transformation function. **[6]**
- b) Explain in brief. (any two) **[4]**
- i) Erosion
 - ii) Dilation
 - iii) Hit or Miss Transform

P.T.O

- Q4)** a) What is histogram equalisation? Write an algorithm for histogram equalisation. What will be nature of image if histogram is concentrated between pixel values 0 to 100? [6]
b) What is the difference between spatial and gray level resolution. Explain its significance w.r.t image analysis. [4]
- Q5)** a) Explain the role of structural element in morphological operations. Draw difference structural elements. How they are selected? [5]
b) Explain RGB and CMY models of colour image. [5]
- Q6)** a) What are chain codes? With suitable example explain how chain codes are used in boundary representation. [6]
b) Compare thinning and thickening process. [4]
- Q7)** a) Draw the block diagram of block transform coding system and explain DCT in brief. [6]
b) Explain the method of convolving a $3 * 3$ mask with the image. How a center ideal is modified. [4]
- Q8)** a) What is wavelet transform? How wavelets are used in signal decomposition? [6]
b) Write a short note on wiener filter. [4]



Total No. of Questions : 8]

SEAT No. :

P4003

[Total No. of Pages : 3

[5155]-251

M.E. (E&TC) (Signal Processing)
SIGNAL PROCESSING TECHNIQUES
(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*

Q1) a) Design an ideal low-pass filter for the following specifications: **[5]**

$$H_d(e^{jw}) = \begin{cases} e^{-j3w} & \text{for } -3\pi/4 \leq w \leq 3\pi/4 \\ 0 & \text{for } 3\pi/4 \leq w \leq \pi \end{cases}$$

Determine the values of $h(n)$ and frequency response $H(e^{jw})$ for $M = 7$ using a Hamming window.

b) Discuss IIR filter design using impulse invariant transformation and list out its advantages and limitations. **[5]**

Q2) a) Design a high-pass filter using bilinear transformation, monotonic in pass band with cut-off frequency of 1000 Hz and down 10 dB at 350 Hz. The sampling frequency is 5000 Hz. **[5]**

b) For adaptive filters, derive the Wiener-Hopf equations. **[5]**

Q3) a) For a digital audio system, design a two stage interpolator for the following system specifications: **[4]**

Highest frequency of interest = 0–20 kHz,

Input sampling frequency = 44.1 kHz,

Output sampling frequency = 176.4 kHz,

Pass band ripple = 0.5 dB

Stop band attenuation = 50 dB.

b) Explain the use of adaptive filter in echo cancellation. **[4]**

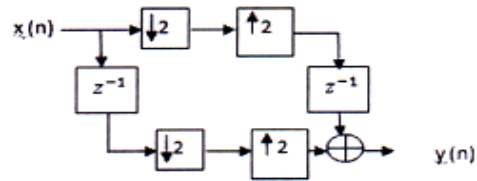
c) What is the need of anti-aliasing filter in decimator? **[2]**

P.T.O

- Q4)** a) A transfer function of FIR filter is $H(z) = \sum_{n=0}^{M-1} h(n)z^{-n}$ and $M=11$. find the magnitude response of the system. [4]
- b) Explain the application of multirate DSP in oversampling ADC and CD Hi-Fi system. [4]
- c) Given analog filter transfer function $H(s) = \frac{10}{s^2 + 7s + 10}$. Determine $H(z)$ equivalent to this transfer function using impulse invariance method for $T=0.2$ sec. [2]
- Q5)** a) What should be the desirable architectural features, type of arithmetic, word length required and execution speed for selecting a DSP processor? [4]
- b) Explain the properties of retiming with example. [4]
- c) Explain locations of poles in FIR filter. [2]
- Q6)** a) Explain Booth's multiplication algorithm in signal processing. [4]
- b) Obtain the polyphase decomposition of the IIR system with transfer function- $H(z) = \frac{1 - 4z^{-1}}{1 + 5z^{-1}}$ for two sections. Also draw the polyphase structure. [4]
- c) Compare von-Neumann, Harvard and Super-Harvard architectures. [2]
- Q7)** a) Derive the expression for the output spectrum of interpolator in terms of input spectrum. [4]
- b) Design a three-stage decimator to reduce sampling rate from 96kHz to 1kHz and satisfies following specifications: [4]
- Pass band ripple = 0.01, stop and band ripple = 0.001, Highest frequency of interest = 450 Hz. Assume decimation factors-8,6,2.

c) Compare FIR filter designing methods. [2]

Q8) a) For the system shown in Fig. below, determine $Y(z)$ in terms of $X(z)$ and $y(n)$ terms of $x(n)$: [4]



b) Explain register minimization technique using folding. [4]

c) What is the use of DAG1 and DAG2 in DSP processor? [2]



[5155]-252

M.E. (E&TC)Signal Processing)

MIXED SIGNAL PROCESSING SYSTEMS & DESIGN

(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) Solve any 5 questions out of 8.
- 2) Each questions carries 10 marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, if necessary.

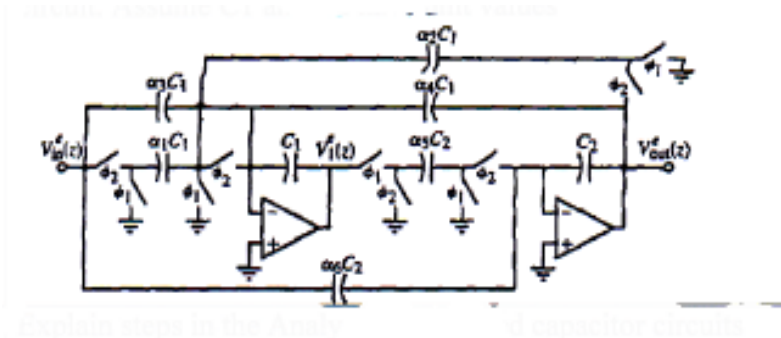
Q1) a) Assume that the Non inverting and inverting voltage amplifiers have been designed for a voltage gain of +10 and -10. if $av_d(0)$ is 1000.find the actual voltage gains for each amplifier. Also draw z-domain model for the deal op amp. [5]

b) Derive value of resistance emulated by a series parallel switched capacitor. [5]

Q2) a) Describe the non idealities in switched capacitor circuits due to MOS transistors and operational amplifier. [3]

b) Enlist advantages of switched capacitor circuits. [2]

c) Assume that the specifications of a switched capacitor high Q biquad are $f_0=1\text{kHz}$, $Q=10$, $K_0=K_2=0$ and $K_1=2\pi f_0/Q$ (a band pass filter). The clock frequency is 100 kHz. Design capacitor ratios for the following figure. Determine maximum capacitor ratio and total capacitance for the following circuit. Assume C_1 and C_2 have unit values. [5]



- Q3)** a) Explain steps in the analysis of switched capacitor circuits. [3]
- b) What is Phase Detector? Explain its-Advantages. [2]
- c) Draw switched capacitor two port circuit for following categories as well as draw four-port Z domain equivalent models and z-domain models for the following configurations. [5]
- i) Parallel Switched Capacitor
 - ii) Negative SC Transresistance
 - iii) Positive SC Transresistance
 - iv) Capacitor and Series switch
- Q4)** a) Draw block diagram of successive Approximation ADC. hence explain operation. [5]
- b) Define wrt DAC
- i) Quantization Noise
 - ii) Dynamic Range
 - iii) Integral and Differential Nonlinearity and
 - iv) Conversion speed [5]
- Q5)** a) Explain difference between Analog PLLs and Digital PLLs. [3]
- b) What are the advantages of Pipeline DAC over Cyclic DAC? [2]
- c) What is VCO? Explain source coupled VCO with the help of suitable diagram, also determine its frequency of oscillation. [5]
- Q6)** a) Explain with suitable diagram the influence of the comparator offset on the flash ADC performance [5]
- b) What is loop filter? Compare active PI and Passive lag loop filter on the basis of k_f , ξ , ω_n , $\Delta \omega L$. [5]
- Q7)** a) A DAC has a full- scale voltage of 4.97 v using a 5 V reference, and its minimum output voltage is limited by the value of one LSB. Determine the resolution and dynamic range of the converter. [5]
- b) Explain how Does the ADC Disrupt the Signal that it is measuring? [3]
- c) What are the advantages of Pipeline DAC over cyclic DAC? [2]

- Q8)** a) What is jitter? Explain its effect in DLL & PLL, also explain its reduction techniques. [3]
- b) Explain cyclic DAC [2]
- c) Explain Digital PLL [5]



Total No. of Questions : 8]

SEAT No. :

P4005

[Total No. of Pages : 2

[5155]-253

M.E. (E&TC)Signal Processing) (Semester - II)

SPEECH SIGNAL PROCESSING

(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Black figures to the right indicate full marks.*
- 4) *All questions carry equal 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.*

- Q1)** a) How can voiced and unvoiced decision be taken using parameters such as energy of segment, ZCR and pitch period. **[5]**
- b) With the help of block diagram explain parallel processing approach of pitch frequency. **[5]**
- Q2)** a) Define Mel Scale & Bark scale. What is the property of mel Scale & Bark scale. **[4]**
- b) What are formants. What is the relation between LPCs & formants. **[4]**
- c) Explain Auto-correlation method of pitch period measurement. **[2]**
- Q3)** a) Explain the following classes of sound. **[5]**
- i) Vowels
 - ii) Consonants
 - iii) Stop
 - iv) Fricatives
 - v) Diphthongs
- b) Explain with block diagram LTI model of speech production system? What its limitations. Hence explain LTV model. **[5]**

P.T.O

- Q4)** a) What is lattice method? Explain Burg algorithm for calculation of predictor coefficients. [5]
 b) Explain the use of LFSs for quantization. How will you convert LFSs to LPCs and LPCs to LFSs. [5]
- Q5)** a) With the help of Block diagram explain homomorphic speech processing. [4]
 b) What is the need of companding? Explain A-law and μ -law companding. [4]
 c) Explain LPC-10 standard. [2]
- Q6)** a) Samples of a signal have values given by 0.2, 0.4, 0.55, 0.7, 0.75, 0.85, 0.9 and 1v. If the data is to be 4 bit coded find:
 i) Step size
 ii) Variance of signal
 iii) Quantization noise power
 iv) SNR in DB [4]
 b) Explain with the help of state diagram HMM for speech recognition. [6]
- Q7)** a) What is speech enhancement? With the help of block diagram explain the spectral subtraction method of speech enhancement technique in detail. [5]
 b) Explain Text to speech conversion system with block schematic? State different applications of TTS. [5]
- Q8)** a) Draw & explain speaker verification system also explain different performance parameters used for speaker recognition. [6]
 b) What are two types of echo? Draw & explain block schematic of echo canceller. [4]



[5155]-254

M.E. (E&TC) (Signal Processing) (Semester - II)
ARCHITECTURE FOR SIGNAL PROCESSING ALGORITHMS
(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

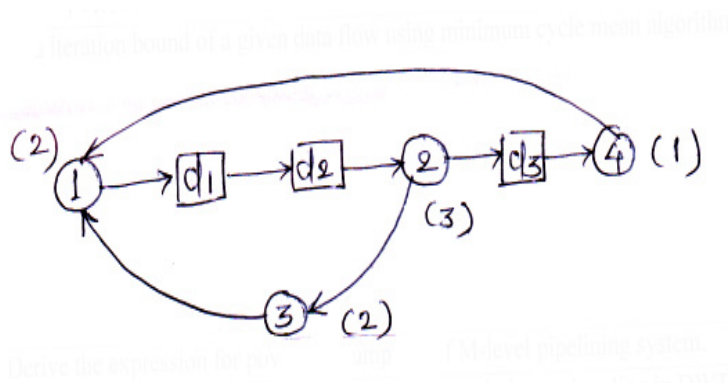
- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Using the property of DFT find the $P(x-1, y-2)$, if **[5]**

$$P(x, y) = \begin{bmatrix} 3 & 1 & 3 & 4 \\ 1 & 2 & 4 & 2 \\ 1 & 4 & 1 & 3 \\ 2 & 2 & 1 & 3 \end{bmatrix}$$

b) Find the filter response of system with $h(n) = \{0, 2, 3\}$ for input signal $x(n) = \{0, 1, 2, 3, 4, 5, 1, 2, 4\}$ using overlap and add method. **[5]**

Q2) a) Find iteration bound of a given data flow using minimum cycle mean algorithm. **[5]**



b) Derive the expression for power consumption of M-level pipelining system. **[5]**

Q3) a) Explain the concept of dyadic, decomposition, translation and scaling in DWT. [4]

b) For a given system apply a retiming technique to reduce a clock period. [4]

$$y(n) = a y(n-1) + b y(n-3) + x(n).$$

Where y is output and x is input & a, b are the constants.

c) Explain the terms

i) Cutset

ii) Feed-forward cutset in signal flow graph. [2]

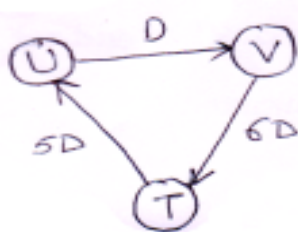
Q4) a) Where hybrid Radix -2 addition is used? Explain the steps carried out in it. [4]

b) Explain Horner's Rule for precision improvement in Canonic signed digit arithmetic. [4]

c) Obtain Canonic signed digit representation of 2's complement number 1.01110011. [2]

Q5) a) What are the limitations of carry ripple multipliers. How to overcome it. [4]

b) Unfold the given graph using folding factor 3. Explain the steps. [4]



c) Explain what is use of systolic array. [2]

Q6) a) Obtain data broadcast structure for a given system [4]

$$y(n) = a x(n) + b x(n-1) + c x(n-2)$$

Where y is output and x is input, a, b, c are the constant for a given system.

b) Calculate DCT for a x(n), where $x(n) = \{1, 3, 2, 4, 1, 5, 4, 2\}$ [4]

c) Explain the use of folding technique in register minimization. [2]

Q7) a) Find DFT using Decimation in time FFT method of [4]

$$x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$$

b) Explain Goertzel algorithm. [4]

c) How parallel processing is useful in power consumption. [2]

Q8) a) Explain the bit serial multiplier using any one method. [4]

b) Construct a 4×4 linear convolution using 2×2 short convolution. [4]

c) What are the properties of DCT. [2]



Total No. of Questions : 8]

SEAT No. :

P4007

[Total No. of Pages : 2

[5155] - 255

M.E. (E&Tc) (Signal Processing)

BIOMEDICAL SIGNAL PROCESSING

(2013 Pattern) (Elective - III) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) Answer any five questions out of 8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Explain the generation of EEG waveform and write the diagnostic applications of EEG. [6]

b) Explain EEG acquisition and different frequency bands in EEG. [4]

Q2) a) Explain sources of bio signals and sources of contamination in bio signals. [6]

b) Draw and explain various types of electrodes used in Biomedical signal acquisition. [4]

Q3) a) Draw the nature of ECG signal and explain the cause of generation of each segment in ECG. [6]

b) What are the methods of QRS detection in ECG? [4]

Q4) a) Explain different topologies of active filters. [6]

b) Draw and explain the isolation transformer and its need in biomedical systems. [4]

P.T.O.

- Q5)** a) Derive Wiener Hopf Equation and state applications of Wiener filters. **[6]**
b) Explain the significance of STFT with the help of suitable equations. **[4]**
- Q6)** a) Compare PCA and ICA and mention their applications. **[6]**
b) What are the methods of QRS detection in ECG? **[4]**
- Q7)** a) Explain in brief AR,MA and ARMA models for spectral estimation of signals. **[6]**
b) Write a short note on Magnetic Resonance Imaging. **[4]**
- Q8)** a) Explain the process for classification of normal and abnormal ECG samples using Multilayer Perceptron. **[6]**
b) Explain **[4]**
i) Transient Protection
ii) Characterisation of signal in frequency domain



[5155] - 256
M.E. (E&Tc) (Signal Processing)
STATISTICAL SIGNAL PROCESSING
(2013 Pattern)

Time : 3 Hour]

[Max. Marks : 50

Instructions to the candidates :

- 1) Solve any 5 questions out of 8.
- 2) Each questions carries 10 marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data, if necessary.

Q1) a) What is signal modeling and least square method of signal modeling? Enlist advantages and disadvantages of least square method of signal modeling. [5]

b) Suppose that a signal $x(n)$ is known to be of the form [5]

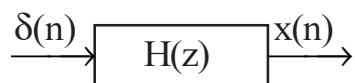
$$x(n) = \sum_{k=1}^L c_k (\lambda_k)^n u(n)$$

Where the λ_k is the distinct complex number.

- i) Show that Pade approximation method can be used to determine the parameters c_k and λ_k for $k = 1, 2, \dots, L$. Is the answer unique?
- ii) The first eight values of a signal $x(n)$, which is known to be of the form given above with $L = 3$, are
 $X = [32, 16, 8, 12, 18, 33, 64.5, 128.25]^T$
Determine c_k and λ_k for $k = 1, 2, 3$.

Q2) a) State and explain Prony's method of signal modeling in detail. [5]

b) Suppose that we would like to model a signal $x(n)$ as shown in the following figure [5]



Where $h(n)$ is an all-pole filter that a system function of the form

P.T.O.

$$H(z) = \frac{b(0)}{1 + \sum_{k=1}^p a_p(k)z^{-k}}$$

Modify the Prony normal equations so that one can determine the coefficients $a_p(k)$ in $H(z)$ from a sequence of signal values, $x(n)$.

Q3) a) Explain in detail AR, MA and ARMA process. [5]

d) Given the sequences of autocorrelation values, [5]

$r_{x(0)=1}, r_{x(1)=0.8}, r_{x(2)=0.5}, r_{x(3)=0.1}$, Find reflection coefficients, Γ_j , the model parameters, $a_{j(k)}$, and the modeling errors, ϵ_j , for $j = 1, 2, 3$.

Q4) a) If $H(z)$ is a p th-order all-pole filter, given $h(n)$ for $n = 0, 1, \dots, N$, then the stability of $H(z)$ may be determined. If this is true, explain the procedure and list any conditions that must be placed on p or N . If false, explain why it cannot be done. [5]

b) Explain MYWE method for modeling an AR (p) process. [5]

Q5) a) Derive Wiener Hopf equation for causal FIR wiener filter. Also give expression for minimum error in terms of autocorrelation matrix $R(x)$. [5]

b) We have a signal $x(n)$. Obtain an all-pole model of the form [5]

$H(z) = \frac{b(0)}{1 + a(1)z^{-1} + a(2)z^{-2}}$ Using the autocorrelation method, find explicit formulas for $b(0)$, $a(1)$ and $a(2)$ in terms of $r_{x(0)}$, $r_{x(1)}$, and $r_{x(2)}$.

Q6) a) State CR lower bound theorem, and explain with its regularity condition. [3]

b) Explain modified covariance method of parametric spectrum estimation. [4]

c) Explain advantages of NLMS over LMS. [3]

- Q7)** a) Compare methods: Bartlett and Welch for periodogram calculation. [3]
b) Write LMS algorithms for nth order FIR filter. State its convergence property. [3]
c) Explain MVUE-minimum variance unbiased estimates. [4]
- Q8)** a) Schur's recursion is well suited to parallel implementation. Justify. [3]
b) Maximum likelihood Estimation (MLE) is asymptotically efficient and attains CRLB, Justify. [4]
c) Explain advantages of lattice filters. [3]



Total No. of Questions : 8]

SEAT No. :

P4009

[Total No. of Pages : 2

[5155] - 257

M.E. (E&TC) (Signal Processing)

**STILL IMAGE AND MOVING PICTURE COMPRESSION
STANDARDS**

(2013 Credit Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

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

Q1) a) What are the drawbacks of EZW and SPHIT? How does EBCOT overcome them? **[5]**

b) With the help of a diagram explain SPHIT algorithm. **[5]**

Q2) a) Explain the following terms in relation to JPEG2000. **[5]**

i) Region of Interest

ii) Scalability

b) Compare JPEG2000 with EZW, SPHIT and EBCOT with respect to resilience feature. **[5]**

Q3) a) What are the different types of image formats used in CCIR-601 standards? **[5]**

b) Explain the role of motion estimation in video codecs. Define the translational model of motion estimation. Explain Pixel-based motion estimation and Block-based motion estimation. **[5]**

Q4) a) Give in brief the system coding outline for MPEG-1. **[5]**

b) What are the picture types in MPEG-1? Give their significance. **[5]**

P.T.O.

- Q5)** a) What are the Preprocessing steps prior to coding in MPEG-1. [5]
b) With the help of an example justify the need for Rate control and Adaptive Quantization in MPEG1 standard. [5]
- Q6)** a) List Non Scalable encoding modes of MPEG2. With the help of neat diagrams explain detail any one Non Scalable mode of MPEG-2. [5]
b) Explain the concept of SNR Spatial and Temporal hybrid scalability. [5]
- Q7)** a) Explain how coding of motion vectors is executed in H.263. [5]
b) Explain loss concealment methods used in H.263. [5]
- Q8)** a) Compare MPEG-4. With H. 263. [5]
b) Give the structure for VOP encoder. Explain how VOP is formed. [5]



Total No. of Questions : 8]

SEAT No. :

P4010

[Total No. of Pages : 2

[5155] - 258
M.E. (E & T/C) (VLSI & Embedded Systems)
DIGITAL CMOS DESIGN
(2013 Pattern)

Time : 3 Hour]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Answer any five questions.*
- 2) *Assume suitable data, if necessary.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Use of non programmable pocket calculator is allowed.*

- Q1)** a) Explore various wiring parasitics in detail. What are its effects on performance of the circuit? How to take care of them? [5]
b) What is SPICE? Explore SPICE model for enhancement type MOFET device in detail. [5]
- Q2)** a) Starting with derivation for power dissipation, explain its relation with the propagation delay of CMOS circuit. [5]
b) Explore cross talk & causes of it. What are solutions while design? [5]
- Q3)** a) Starting with different operating regions of MOSFET, explore equivalent circuits along with parasitics. [4]
b) Draw layout view & cross section of CMOS Inverter. Mention dimensions. [4]
c) Write note on interconnects. [2]
- Q4)** a) What is need of logical efforts? What are the techniques involved? How does it lead to optimization of CMOS circuit? [4]
b) Explain the delay estimation techniques in detail. Give suitable example. [4]
c) What are the advantages of transistor sizing? [2]

P.T.O.

- Q5)** a) With the help of Voltage Transfer Characteristics of CMOS Inverter, explain overall threshold & cares to be taken for symmetry. [4]
b) Design D flip flop using transmission gates. What are limitations? [4]
c) What is meant by active area on chip? Give example. [2]
- Q6)** a) Draw FSM diagram for coffee vending machine. Write HDL code. [4]
b) Design CMOS logic for $F = A + BCD$. Compare with other methods with respect to area on chip. [4]
c) Write note on metastability. [2]
- Q7)** a) Explore dynamic circuits in detail. [4]
b) What is need of NORA logic? Explain operation of such typical logic. [4]
c) What is effect of lowering threshold voltage of MOSFET on speed? Explain. [2]
- Q8)** a) Explore high speed design techniques in detail. [4]
b) What is necessity of sense amplifier circuit? With the help of diagram, explain the operation of such typical circuit. [4]
c) Write note on static CMOS. [2]



Total No. of Questions : 8]

SEAT No. :

P4011

[Total No. of Pages : 2

[5155] - 259

M.E. (E&Tc) (VLSI & Embedded Systems)

EMBEDDED SYSTEM DESIGN

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Attempt any Five questions.*
- 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.*

- Q1)** a) Compare the functional and architectural model of an embedded system. [3]
- b) Write short note on various development tools used in embedded system design. [3]
- c) What is the major reason for partitioning a system? During which stage of design, system partition occurs? [4]
- Q2)** a) Explain the Design and Development lifecycle model of an embedded system. [6]
- b) Discuss System requirements verses system specifications. [4]
- Q3)** a) Explain with block diagram ARM9 TDMI Processor core. [5]
- b) Discuss the architectural support provided in ARM processor for an operating system. [5]
- Q4)** a) Explain in detail memory hierarchy & memory subsystem architecture. [5]
- b) Write a note on I2C & SPI Protocol. [5]

P.T.O.

- Q5)** a) Explain Flash File System in an embedded linux system. [5]
b) Explain Embedded Linux System Architecture [3]
c) Compare between BIOS and Boot Loader. [2]
- Q6)** a) What are different types of device driver? Why device drivers are essential? [4]
b) Explain in brief the Linux kernel build system. [3]
c) Explain various storage consideration in Embedded Linux System. [3]
- Q7)** a) Explain in detail Android manifest file and its structure. [5]
b) Discuss the advance operation with Android like telephony &SMS. [5]
- Q8)** a) Explain various network services support provided by Android OS. [3]
b) What is an Intent in Android? Also explain the term Intent filters? [4]
c) Write note on APIs with reference to Android OS. [3]



Total No. of Questions : 8]

SEAT No. :

P4012

[Total No. of Pages : 2

[5155] - 260

M.E. (E&Tc) (VLSI & Embedded Systems)

RECONFIGURABLE COMPUTING

(2013 Pattern) (Semester - I)

Time : 3 Hour]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Answer any Five questions.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculators is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Elaborate reconfigurable device characteristic. [4]
b) Explain the general purpose computing issues. [4]
c) Give block level structure of FPGA. [2]
- Q2)** a) Explain the term Space Time Metric and Instruction Density along with suitable example. [5]
b) Review the General Purpose Computing Architecture in age of MOS VLSI. [5]
- Q3)** a) Elaborate on Memory as platform for implementation of complex computations. [4]
b) Give and explain area distribution for 4-LUT. [4]
c) Explain the term Granularity. [2]
- Q4)** a) Brief on interconnect topology for conventional FPGA, what modification you can suggest for reconfigurable networks. [4]
b) Give in detail channel and wire growth according to rents rule. [4]
c) Define the term Network Utilization Efficiency. [2]

P.T.O.

- Q5)** a) What is need of instruction compression? Give different techniques and explain the one suitable for RD. [4]
b) How to compute area on chip per bit PE? Give the expression and explain. [4]
c) Explain the term Performance density [2]
- Q6)** a) Draw and explain the architecture of TSFPGA. [5]
b) Explain with suitable diagram the time switched input register. [5]
- Q7)** a) Draw and explain basic functional unit (BFU) of MATRIX architecture. [5]
b) Compare MARTIX with general purpose computer. [5]
- Q8)** a) Explain Video Streaming as the application of RC. [4]
b) Explain Multicontext FPGA as platform for RC. [4]
c) Brief on the term partial reconfigurability. [2]



[5155] - 261

M.E. (E&Tc) (VLSI & Embedded System Design)

ANALOG CMOS DESIGN

(2013 Pattern) (Semester - II)

Time : 3 Hour]

[Max. Marks : 50

Instructions to the candidates :

- 1) Answer any Five questions.
- 2) Figures to the right indicate full marks.
- 3) Use of electronic pocket calculators is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) Discuss the effect of channel length modulation and body effect on MOSFET and show how these are taken care of in small signal equivalent model. [5]

b) For the circuit of CS amplifier with diode connected load as shown in Fig. 1, calculate small signal voltage gain if $(W/L)_1 = 50/0.5$. $(W/L)_2 = 10/0.5$ and $I_{D1} = 0.5$ mA. Assume $\mu_n C_{ox} = 2\mu_p C_{ox} = 60$ $\mu\text{A}/\text{V}^2$. Also find voltage gain if M_2 is PMOS. Neglect second order effects. [5]

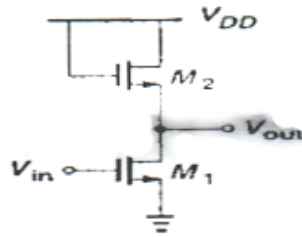


Figure 1

- Q2) a) With the help of suitable schematic and expressions, explain MOSFET as a switch, diode and active resistor. [5]
- b) What is band gap reference circuit, draw any one band gap voltage or current reference circuit and explain the same. [5]

P.T.O.

Q3) a) List and elaborate the important performance parameters of CMOS operational amplifier. [5]

b) Draw cascode amplifier with current source load and list its advantages and limitations over single stage CS and CG amplifier. [5]

Q4) a) Determine the differential and common mode voltage gain of the circuit shown in Fig 2. Assume $\lambda \neq 0$, also M_1 and M_2 are identical and M_3 and M_4 also. Also find CMRR. assume non ideal tail current source with internal resistance R_{ss} . [5]

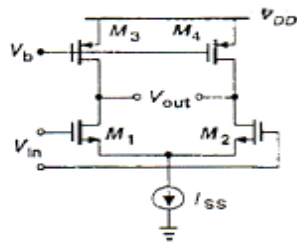


Figure 2

b) Draw circuit diagram of two stage CMOS op amp and explain its working. [5]

Q5) a) List and elaborate static characteristics of Digital-to-Analog converter. [4]

b) How zeros work as bandwidth enhancers, give expression of bandwidth of such circuit. [4]

c) What is effect of source degeneration resistance on the voltage gain of CS amplifier? [2]

Q6) a) Write short notes on [6]

i) Tuned amplifiers

ii) DAC topologies in CMOS monolithic circuits

iii) High speed op amps

b) Explain in detail open and short circuit techniques for bandwidth estimation. [4]

- Q7)** a) What is difference between active and passive mixers. Draw' and explain their architectures. [5]
- b) List and elaborate the design considerations for RF chip. [5]
- Q8)** a) Draw circuit diagram of differential LNA and explain how it overcomes drawbacks of single ended LNA. [5]
- b) With the help of different Low Noise Amplifier (LNA) topologies explain how noise and power trade off is achieved. [5]



Total No. of Questions : 8]

SEAT No. :

P4014

[Total No. of Pages : 2

[5155] - 262

M.E. (E&TC) (VLSI & Embedded Systems)

SYSTEM ON CHIP DESIGN

(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Answer any Five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculators is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Explain the driving factors in Hardware/Software Co-design. [4]
b) Explain dualism of hardware design and software design. [4]
c) Explain cycle-accurate abstraction level. [2]
- Q2)** a) Explain with example control flow modelling. [4]
b) Explain the concept of multithread dynamic schedules. [4]
c) Which steps one need to following to convert a multirate graph to a single-rate graph? [2]
- Q3)** a) Which parameters and methods for FIFO queue requires? [4]
b) How to map dataflow into software using sequential schedule? [4]
c) Draw and explain Control flow graph of a 'for loop'. [2]
- Q4)** a) Differentiate Microprogrammed controller Vs FSM. [4]
b) Explain design trade-offs of the microinstruction format. [4]
c) When structural hazards occur? [2]

P.T.O.

- Q5)** a) When write-write race occurs? Explain it with an example? [4]
b) How to avoid simulation race? [4]
c) What is purpose of IEEE Standard 1364-1995? [2]
- Q6)** a) Which problem arises due to Metastability? [4]
b) How FIFO is used to prevent data loss? [4]
c) Explain full timing gate level simulation (FTG S) in detail. [2]
- Q7)** a) Draw and explain RTL to GDSII design flow. [4]
b) Explain the motion estimation architecture. [4]
c) Which good factors one should use for image/video codec design? [2]
- Q8)** a) Explain multilayered, quality-aware memory controller features. [4]
b) Explain hard real-time DPM polices. [4]
c) Explain the SOC test wrapper operation modes. [2]



Total No. of Questions : 8]

SEAT No. :

P4015

[Total No. of Pages : 2

[5155] - 263

M.E. (E&TC) (VLSI & Embedded Systems)

EMBEDDED SIGNAL PROCESSORS

(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Attempt any five questions.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *All questions carry equal marks.*
- 4) *Assume suitable data wherever required.*
- 5) *Figures to right indicates full marks.*

- Q1)** a) Explain Moving-Average Filters with their Structures and Equations. [4]
b) Discuss Linear Convolution with suitable example. [3]
c) Explain the terms convolution, correlation & covariance. [3]
- Q2)** a) Compare FIR & IIR filters. Which types of filters are used more in practice? Why? [4]
b) What is zero-padding? Explain its significance. [3]
c) Explain applications of Notch Filters. [3]
- Q3)** a) Explain Linear & Non-Linear filters with suitable examples. [4]
b) Explain Design and Applications of Adaptive Filters. [3]
c) Describe Sampling & Quantization. [3]
- Q4)** a) Discuss design steps of IIR filters using Bilinear Transformation method. [4]
b) Write a short note on DFT. [3]
c) Explain FFT. [3]

P.T.O.

- Q5)** a) What are structures? Explain its types. [4]
b) Explain the characteristics of Window Function. [3]
c) Write short note on Gibb's phenomenon. [3]
- Q6)** a) Describe MAC and Barrel shifter in DSP processors. [4]
b) Explain application of DSP in image processing. [3]
c) Draw and Explain architecture overview of Black fin processor. [3]
- Q7)** a) Explain the architecture of DSP processor with neat diagram. [4]
b) Give different addressing formats of DSP processors. [3]
c) With neat block diagram explain the software development tools used for designing DSP system. [3]
- Q8)** a) Explain Wavelet algorithm in brief. [4]
b) Discuss the DSP application in image enhancement. [3]
c) Explain adaptive filtering algorithm for system identification. [3]



Total No. of Questions : 8]

SEAT No. :

P4016

[Total No. of Pages : 2

[5155] - 264

M.E. (E&TC) (VLSI & Embedded Systems)

FAULT TOLERANT SYSTEMS

(2013 Credit Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to candidate :

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Assume suitable data, if necessary.*
- 3) *Solve any five questions.*

Q1) a) Define

- i) Cube
- ii) Primitive cube.

What is the procedure of constructing a cube? [5]

- b) Construct a binary decision diagram for a JK flip-flop with asynchronous set (S) & reset (R) inputs. [5]

Q2) a) Briefly explain following types of cross point faults. [8]

- i) Shrinkage fault
- ii) Growth fault
- iii) Appearance fault
- iv) Disappearance fault.

- b) Discuss the term pin-fault model. [2]

Q3) a) Explain following terms : [4]

- i) Stuck RTL variables
- ii) Fault variables

- b) Describe the working of self checking checkers. [6]

P.T.O.

- Q4) a)** Define bridging fault. Find test vector that determine the OR bridging fault between input A & B in the following figure (Figure 1). [4]

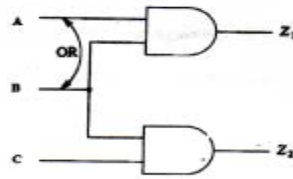


Figure 1

- b) Explain how testing is performed using test-response compression technique. Draw a suitable diagram. [6]
- Q5) a)** How to detect hazards present in asynchronous circuits? [6]
- b) List any four benefits of on-line testing. [4]
- Q6) a)** With the help of suitable diagram explain the triple modular redundancy (TMR) technique used in fault tolerant design. [5]
- b) Discuss the functional & structural forms of off-line BIST techniques. [5]
- Q7) a)** Draw & explain chip architecture for IEEE 1149.1. [8]
- b) Briefly explain exhaustive form of testing. [2]
- Q8) a)** Write a short note on syndrome testing. [6]
- b) Define following terms : [4]
- i) Structural faults
 - ii) Functional faults



Total No. of Questions : 8]

SEAT No. :

P4017

[Total No. of Pages : 2

[5155] - 265
M.E. (E&Tc) (VLSI & Embedded Systems)
ASIC DESIGN
(2013 Credit Pattern) (Semester - III)

Time : 3 Hour]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Answer any Five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures of the right indicate full marks.*
- 4) *Use of electronic pocket calculators is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Explain the sequence of steps to design an ASIC. [4]
- b) Explain the characteristics and performance of following design styles [4]
- i) Standard cells
 - ii) Cell based ASICs
- c) What is delta delay in VHDL? What is its significance? [2]
- Q2)** a) Explain the various types of ASICs in detail. [4]
- b) What do you mean by ASIC cell library? And what should it contain? [3]
- c) Compare different ASIC technologies. [3]
- Q3)** a) Explain global process variation with respect to mixed signal analogue and digital design by giving an example. [4]
- b) How does boundary of any device affects in mixed signal ASIC explain by giving an example. [4]
- c) Write a note on analogue and digital simulation. [2]

P.T.O.

- Q4)** a) Explain the hierarchical organization adopted in mixed signal ASIC. [4]
b) What are the different testing approaches for mixed signal Analogue and Digital circuits? [3]
c) Explain signal integrity effects in ASIC design. [3]
- Q5)** a) What are different objectives of system partitioning and explain different algorithms used for the same. [4]
b) What are the factors contributes to best floor planning? Explain in detail.[3]
c) What is parameter extraction pertaining to ASIC design? [3]
- Q6)** a) What are the approaches to global routing? Explain in detail one algorithm to find shortest path. [4]
b) Differentiate pre layout and post layout simulation with respect to ASIC. [3]
c) What is IR drop? How it impacts the chip performance? Explain with an example. [3]
- Q7)** a) Explain in detail about ATPG algorithm using test vectors with neat diagram. [5]
b) Explain the ASIC verification and its issues. Write the features of any four EDA tools. [5]
- Q8)** a) Briefly describe about Boundary Scan Test with suitable example. [5]
b) Explain different types of stuck at fault models with the help of examples. [5]



Total No. of Questions : 8]

SEAT No. :

P4018

[Total No. of Pages : 2

[5155] - 266

M.E. Computer Engineering
APPLIED ALGORITHMS
(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Answer any Five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *All questions carry equal marks.*
- 5) *Assume suitable data if necessary.*
- 6) *Use of calculator is allowed.*

- Q1)** a) State whether following equalities are correct or incorrect and prove it. **[5]**
- i) $10n^2 + 5n + 6 = \Omega(n^4)$
 - ii) $4n^4 - 6n = \theta(n^2)$.
- b) Define and discuss the different characteristics of algorithm with suitable example. **[5]**
- Q2)** a) Explain in detail Theta and Omega notation with example. **[5]**
- b) Explain the Best, Average, and Worst case of Merger sort and Insertion sorting algorithm. **[5]**
- Q3)** a) Describe single source shortest path Algorithm in graph. **[5]**
- b) Write about the application of Greedy approach. **[5]**
- Q4)** a) Explain Prim's Algorithm for minimum spanning tree. **[5]**
- b) What is convex hull? Explain how convex hull is computed. What is its time complexity? **[5]**

P.T.O.

- Q5)** a) Explain the Red-Black Trees. [5]
b) Write the Approximation Vector cover Algorithm. [5]
- Q6)** a) Write recursive binary search algorithm and determine its time complexity by recurrence. [5]
b) What are the basic properties of Line, Intersection of Line and Line Segment? [5]
- Q7)** a) Describe the standard form for the LPP. [5]
b) Explain simplex method of LPP with example. [5]
- Q8)** a) Write short note on Epsilon Approximation. [5]
b) Explain Exception, Moments and variance with example. [5]



Total No. of Questions : 6]

SEAT No. :

P4019

[Total No. of Pages : 2

[5155] - 267
M.E. (Computer Engineering)
HIGH PERFORMANCE DATABASES
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *All six questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*

- Q1)** a) What are the choices in tuning the conceptual schema? What are the technique and when should we apply them; settling for a weaker normal form, de-normalization and horizontal and vertical decomposition [4]
b) Why do we have standardized database benchmarks, and what common Metrics are used to evaluate database system? Describe a few popular Database benchmarks. [4]
- Q2)** a) Discuss design issues of Distributed Databases Framework. [4]
b) Explain translation of global queries to fragment queries for distributed databases. [4]
- Q3)** a) Why was the TPC-D benchmark replaced by the TPC-H and TPC-R benchmarks? [4]
b) Write a short note on (Any One)
i) Long Duration Transaction
ii) Main Memory Database [4]
- Q4)** a) Write XML representation of the following nested-relational schema [5]
Emp = (ename, ChildrenSet setof(Children), SkillsSet setof(Skills))
Children = (name, Birthday)
Birthday — (dat, month, year)
Skills — (type, ExamsSet setof(Exams))
Exams = (year, city)

P.T.O.

Write following queries in XQuery

- i) Find the names of all employees who have a child who has a birthday in March.
 - ii) Find those employees who took an examination for the skill type “typing” in the city “Dayton”
- b) Explain XSLT with suitable example. **[3]**
- Q5)** a) Analysis and Design the requirements for any Mobile Database application which consist of semi structured and unstructured data using any standard Mobile Database. **[5]**
- b) Explain Temporal Database with suitable example. **[4]**
- Q6)** a) Design fully Distributed Hadoop framework for large scale data management and analytics with suitable business application. **[5]**
- b) Write a short note on (any one) : **[4]**
- i) COUCHDB.
 - ii) Maps Reduce



Total No. of Questions : 6]

SEAT No. :

P4020

[Total No. of Pages : 3

[5155] - 268
M.E. (Computer Engineering)
ADVANCED COMPUTER ARCHITECTURE
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

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) *Assume suitable data, if necessary.*

- Q1)** a) What is shared memory concept? Explain the different shared memory multiprocessor models. **[5]**
- b) What is the significance of PRAM models? Describe the four variants of PRAM model **[4]**

OR

- a) State granularity for parallel processing. Explain the granularity at various levels. **[5]**
- b) How Flynn has classified parallel computers? Why MISD architecture does not exist? **[4]**
- Q2)** a) What scalability determine. List & explain the factors affecting scalability. **[4]**

- b) Explain the Gustafson's for fixed time speed for scaled program sizes. **[4]**

OR

- a) Derive Amdahl's speedup performance law Explain benchmark standards. **[4]**
- b) What is the degree of parallelism. Describe average parallelism in terms of DOP. **[4]**

P.T.O.

- Q3)** a) Can pipeline increase the throughput. Explain the instruction & processor pipeline. [4]
- b) Compare the RISC & CISC architectures. [4]

OR

- a) Comment on how the superscalar can increase performance with VLIW architecture. [4]
- b) Explain the memory hierarchy. What are the three locality properties in memory references. [4]

- Q4)** a) What is cache coherency problem. How the directory based protocol overcome the problem updating the cache blocks. [5]
- b) State the latency hiding techniques . Explain the relaxed memory consistency. [4]

OR

- a) What is vectorization & instruction types? Explain the distributed memory model in SIMD computer organization [5]
- b) Discuss the dataflow architecture. Explain with dataflow graph with example. [4]

- Q5)** a) Convert following scalar code to vector code [4]

Do 20 I = 1, N

$$A(I) = B(I) + C(I)$$

$$20 \quad B(I) = 2 * A(I + 1)$$

Explain techniques used to convert code to optimized code with example

- b) Explain the features of parallel programming languages for program development. [4]

OR

- a) What conditions are for better critical section? Explain message passing & shared memory model. [4]
- b) Explain the semaphore & monitor to improve the processor utilization. [4]

Q6) Explain in brief the following (any two)

[8]

- a) Neuro computing
- b) Grid computing
- c) Quantum computing

OR

Draw & explain layered architecture of cloud? What are the security threats in the cloud & services provided.

[8]



Total No. of Questions : 6]

SEAT No. :

P4021

[Total No. of Pages : 2

[5155] - 269
M.E. (Computer Engineering)
RESEARCH METHODOLOGY
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

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

Q1) a) Research is much concerned with proper fact finding, analysis and evaluation.” Do you agree with this statement? Give reasons in support of your answer. **[8]**

OR

(b) What is the difference between research methods and methodology? Explain research process in detail? **[8]**

Q2) a) What is research problem? Define the main issues which should receive the attention of the researcher in formulating the research problem. Give suitable example to clarify your points. **[9]**

OR

b) What is hypothesis and hypothesis formulation? What characteristics it must possess in order to be a good research hypothesis? **[9]**

Q3) a) Explain the meaning of research design and its category. **[8]**

OR

b) Choose any research problem in computer engineering field to conduct the research. State different research designs and select suitable research design method for the problem you identified and justify why you selected that particular design method. **[8]**

P.T.O.

Q4) a) Enumerate the different methods of collecting data. Which one is the most suitable for conducting enquiry regarding family welfare program in India? Explain its merits and demerits. **[8]**

OR

b) Explain the use of analysis of variance (ANOVA) and covariance (ANACOVA). Briefly explain multivariate ANOVA. **[8]**

Q5) a) What are the various Kinds of charts and diagrams which are used in data analysis? Distinguish Between line chart, bar chart and histogram. **[8]**

OR

b) Distinguish between primary data secondary data and enlist the important methods of collecting primary data. **[8]**

Q6) a) State in brief layout of research report and Discuss the role played by bibliography in context of research report. **[9]**

OR

b) What is the queuing theory? What is little's law and explain its use in queuing theory with suitable examples. **[9]**

▽▽▽▽

Total No. of Questions : 12]

SEAT No. :

P4022

[Total No. of Pages : 2

[5155] - 270
M.E. (Computer Engineering)
OPERATING SYSTEM DESIGN
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Neat diagram must be drawn whenever necessary.*
- 2) *Assume suitable data, if necessary.*
- 3) *Figures to the right indicate full marks.*

- Q1)** a) What do you mean by the transformation of a resource? What are the four resources of a virtual computer? [5]
- b) How do the base and bound registers control access to memory in user mode? What if they were used in system mode? [4]

OR

- Q2)** a) State and explain the UNIX process related system calls. [5]
- b) What is Little language? Explain it using print f and title line example. [4]

- Q3)** a) When race condition will occur? What is race condition? Explain the race condition involving the increment of the shared variable. [4]
- b) What is the basic idea of the Producer Consumer IPC pattern? [4]

OR

- Q4)** a) What is mean by highest - response ratio - next scheduling and shortest - job - first scheduling? What is response ration? [4]
- b) Explain how indirection formats are an example of separation of concepts. [4]

- Q5)** a) What are the three objects the simple operating system implements, and what operations are allowed on them? [4]
- b) What is process dispatching? State the various points in the operating system from where dispatcher is called? [4]

OR

P.T.O.

- Q6)** a) What does it mean when the timer interrupt? State this interrupt of what is going on in the simple operating system? [4]
b) What are the disadvantages of using two operating systems in a multiprocessor system? [4]

- Q7)** a) State and explain the process of creating a load module from source program? What is object module? Explain it with format. [4]
b) Give the relative advantages and disadvantages of load time dynamics linking and run time dynamic linking [4]

OR

- Q8)** a) Explain the memory management design problem [4]
b) What is the cost of virtual memory? Explain it by taking suitable example. [4]

- Q9)** a) How disk performance can be improved in operating system using caching? Explain the design techniques for caching and hinting. [4]
b) What is the purpose of file name extensions? Give any eight examples. [4]

OR

- Q10)** a) How file blocks are located on disks? What is meant by continuous file and interleaved files? Which is better solution? [4]
b) Explain the design techniques for hierarchical names. Elaborate using computer science examples [4]

- Q11)** a) State and explain the resource management issue? Why efficiency is hard to define in context with resource management? [5]
b) What is Little Law? Explain the mathematical model of scheduling as a system of queues [4]

OR

- Q12)** a) What is the importance of protection of resources? State and explain the resources that need protection [5]
b) How cryptography can be used for privacy? What is meant by digital signature? How it ensures its functionality? [4]

▽▽▽▽

Total No. of Questions : 6]

SEAT No. :

P4023

[Total No. of Pages : 2

[5155] - 271

M.E. (Computer Engineering)

SOFTWARE DESIGN AND ARCHITECTURE

(2013 Pattern) (Semester - II)

Time : 3 Hour]

[Max. Marks : 50

Instructions to the candidates :

- 1) Solve question number 1 or 2, 3 or 4 and 5 or 6.
- 2) Neat diagram must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Write in short the applicability, structure and implementation of:- [8]

- i) Abstract factory
- ii) Singleton

b) Discuss the major phases of the software design process and illustrate the characteristics of an exceptional designer. [8]

OR

Q2) a) Explain design patterns? How they are documented using a template? Explain the way they are documented with examples to illustrate from Observer pattern. [8]

b) Describe the design viewpoints for software design notation. [8]

Q3) a) Illustrate the mapping quality factors to quality criteria for assessing design quality? List different quality attributes. [8]

b) Differentiate between reference architectural and an architectural pattern in terms of organizational planning and architectural analysis? Explain with suitable example. [8]

OR

Q4) a) Explain the concept of systematic reuse and its particular implementation using product lines? [8]

b) Explain Execution architecture view and Code architecture view. [8]

P.T.O.

- Q5) a)** Explain the concepts of Hierarchical architecture and Distributed Architecture. Evaluate the benefits and limitations of both. **[9]**
- b) Write short notes on :- **[9]**
- i) Model Driven Architecture (MDA)
 - ii) Customer Relationship Management (CRM)

OR

- Q6) a)** Describe Quantity archetype pattern and Rule archetype pattern with example. **[9]**
- b) Explain the concepts of any three archetype patterns. **[9]**

▽▽▽▽

Total No. of Questions : 6]

SEAT No. :

P4024

[Total No. of Pages : 2

[5155] - 272

M.E. (Computer Engineering)

ADVANCED COMPUTER NETWORKS

(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *All questions are 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.*

Q1) a) What are the different capabilities which are collectively referred to as “intelligence” within the network? Discuss these capabilities with respect to network design. [9]

OR

b) Explain different components of Network design tool and write the process of network design. [9]

Q2) a) Compare M/M/1 Queue, M/M/2 Queue and M/M/m Queue with the help of state transition diagram and applications. [8]

OR

b) On a network gateway, measurements show that the packets arrive at a mean rate of 125 packets per second (pps) and the gateway takes about 2 milliseconds to forward them. Assuming an M/M/1 model, what is the probability of buffer overflow if the gateway had only 13 buffers? How many buffers are needed to keep packet loss below one packet per million? [8]

Q3) a) Explain the horizontal and vertical approaches to network representation based on the amount of effort required to add and delete nodes, links, and properties. [8]

OR

b) Explain, with the help of suitable example, Esau-William’s Algorithm. [8]

P.T.O.

Q4) a) What is quality of service in network design? Explain different QOS mechanisms. [8]

OR

b) Explain various traffic engineering methods. [8]

Q5) a) Differentiate between IPV4 and IPV6 header formats. Explain aggregation feature in IPV6. [8]

OR

b) Explain ubiquitous computing with design issues and challenges. [8]

Q6) a) Explain the use of computer network simulation with suitable example. [9]

OR

b) What is cyber physical system? Enlist and explain its various components and compare it with existing technologies like robotics, embedded systems, etc. [9]

▽▽▽▽

Total No. of Questions : 6]

SEAT No. :

P4025

[Total No. of Pages : 2

[5155] - 273

M.E. (Computer Engineering)

**ADVANCED STORAGE SYSTEMS & INFRASTRUCTURE
MANAGEMENT**

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Attempt any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) a) What is intelligent storage system (ISS). Describe Components of ISS. **[5]**

b) Which components Consistute disk service time? Discuss disk drive performance. **[5]**

Q2) a) Write short note on **[5]**

i) Cloud storage

ii) FAST

b) Give an overview of FCSAN & IPSAN. **[5]**

Q3) a) Discuss remote replication technology in detail. **[5]**

b) Write short note on **[5]**

i) De-duplication.

ii) Offsite backup.

Q4) a) What are various infrastructure management activities? Discuss. **[5]**

b) Write short note on value of systems management for business. **[5]**

P.T.O.

- Q5)** a) Explain infrastructure management pattern for IT Systems management. [5]
b) Discuss Information technology Infrastructure Library. [5]
- Q6)** a) Write short note on Problem management. [5]
b) Discuss Capacity management. [5]



Total No. of Questions : 7]

SEAT No. :

P4026

[Total No. of Pages : 2

[5155] - 274
M.E. (Computer Engineering)
Advanced UNIX Programming
(2013 Credit Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Attempt ANY FIVE out of SEVEN questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of Calculator is allowed.*

- Q1)** a) Explain in brief process utilities and disk utilities. [5]
b) Write a short note on networking commands. [5]
- Q2)** a) Explain five ways of process termination. [5]
b) Explain vfork(), fork(), functions in brief. [5]
- Q3)** a) Explain in brief I/O multiplexing. [5]
b) Write a short note on Memory Mapped I/O. [5]
- Q4)** a) Explain FIFOs and message queues in brief. [5]
b) Explain in brief pipes characteristics and reading and writing from a pipe. [5]
- Q5)** a) Write a short note on Multithreading and prethreading. [5]
b) Explain in brief stubs and skeletons. [5]

P.T.O.

- Q6)** a) Write a short note on Routing socket and Raw socket. **[5]**
b) Design of a simple client and server based echo server with threading. **[5]**

Q7) Write short notes on any two of the following : **[10]**

- a) exit(), wait(), waitpid() functions
- b) msgget(), msgsnd(), msgrcv() functions
- c) Memory Coherency



Total No. of Questions : 12]

SEAT No. :

P4027

[Total No. of Pages : 2

[5155] - 275

M.E. (Computer Engineering) (Computer Networks)

ADVANCED NETWORK ALGORITHMS

(Credit Pattern) (2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Attempt questions Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, and Q9 or Q10, and Q11 or Q12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*

Q1) a) Justify that network algorithmics recognizes the primacy of systems thinking. [4]

b) Elaborate the effect of Network bottlenecks on network performance.[4]

OR

Q2) a) What network algorithmic issue is represented by the “problem of Scenting an Evil Packet”? [4]

b) Explain scheduler for Asynchronous transfer mode flow control problem. [4]

Q3) a) What do you mean by network implementation models? Explain in brief.[4]

b) How Router Architecture can be optimized to improve performance?[4]

OR

Q4) a) Distinguish between Design and Implementation principles. [4]

b) Explain buffer validation of Application Device Channels. [4]

Q5) a) Besides faster error recovery what does fine-granularity timers do? [5]

b) Explain in details four component routines of a timer module. [4]

OR

Q6) With the help of neat diagrams, explain two common schemes for timer implementation. [9]

P.T.O.

Q7) Write a short note on packet repeater. **[8]**

OR

Q8) With respect to challenge 1 for Ethernet, explain design of a bridge connecting two Ethernets. **[8]**

Q9) a) What is Packet classification problem? **[4]**

b) With respect to packet classification, explain divide and conquer. **[4]**

OR

Q10)List and explain the principles related to look-up operations used in the classification algorithms. **[8]**

Q11)a) What factors make distributed systems evil? Justify. **[5]**

b) List and explain in brief Principles used in the various distributed systems techniques. **[4]**

OR

Q12)With reference to distributed systems what is approximate string matching?**[9]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

P4028

[Total No. of Pages : 2

[5155] - 276
M.E. (Computer Networks)
WIRELESS COMMUNICATION
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be whenever necessary.*
- 3) *Assume suitable data, if necessary.*

- Q1)** a) What are the various Business Challenges for Broadband Wireless and WiMAX
- b) Explain number of optional advanced features for improving the performance in WiMAX

OR

- Q2)** a) Explain wireless digital communication systems with key building blocks also discuss on Multipath Propagation?
- b) Write short note on OFDMA in WiMAX: Protocols and Challenges.
- Q3)** a) Explain Handoff Management in WiMax network, also discuss Handoff detection based on signal strength.
- b) Explain MPLS network and components with suitable diagram.

OR

- Q4)** a) Explain 3 GPP Network Architecture.
- b) What are the advantages of Duobinary turbo codes over conventional binary turbo codes. Also explain Turbo Encoder in IEEE 802.16e- 2005.

P.T.O.

- Q5)** a) Explain with figure Logical representation of the end-to-end WiMAX architecture.
- b) Explain Protocol stack for user authentication in WiMAX with Figure.

OR

- Q6)** a) Explain Handover scenarios with ASN anchored mobility and CSN-Anchored Mobility supported in WiMAX. [7]
- b) What is the need of Paging and Idle-Mode Operation? Explain WiMAX paging reference model. [6]

- Q7)** a) Explain Methodology for Link Level simulation. [7]
- b) Compare 2G, 3G and 4G technologies. [6]

OR

- Q8)** Write Short Notes on (any two) [13]
- a) Internetworking between WLANS and 3G
- b) Closed-loop MIMO
- c) Benefits of Multiple-antenna Techniques in Wi MAX

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

P4029

[Total No. of Pages : 2

[5155] - 277

M.E. (Computer Networks) (End Semester)

ADVANCED DATABASES

(2013 Course)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

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

Q1) a) What is database Tuning. Why Database tuning. How do you tune database performance? [6]

b) Explain the distributed transaction management in detail. [6]

OR

Q2) a) What is Database Workloads. How to tune the conceptual Schema. [6]

b) What is Fragmentation. Discuss about horizontal, vertical and mixed fragmentation. [6]

Q3) a) What is Multi Databases. Discuss how Transaction Management is handled in Multi-databases. [6]

b) Explain the Tree Model of XML and XPath? [6]

OR

Q4) a) Explain with diagram Application of Many-Server, Many-Router Model & Many - Server Single router Model in TP Monitor Architecture. [6]

b) Write short Note on (Any two) [6]

- i) XML Parsing
- ii) WSDL
- iii) XPointer

P.T.O.

- Q5) a)** Discuss how the following terms are addressed in real time databases. [6]
- i) Transaction Processing
 - ii) Concurrency control
 - iii) Locking methods
- b) Explain Spatial database in details. How it is different from GIS. [7]

OR

- Q6) a)** Explain the concept of multimedia database along with types. [6]
- b) What is mobile databases. Discuss the issues and problems faced in case of mobile databases. [7]

- Q7) a)** What is CouchDB. Explain how the basic operation of adding data and updating data is handle. [6]
- b) Define Performance benchmarking. Discuss the commonly used benchmark measures. [7]

OR

- Q8) a)** Discuss in detail distributed computing with MAPREDUCE and PIG. [6]
- b) Define E-Commerce and discuss any two of the following E-Commerce application : [7]
- i) E-Catalogs
 - ii) Order settlement
 - iii) Secure Payment System
 - iv) Digital Cash

▽▽▽▽

Total No. of Questions : 6]

SEAT No. :

P4030

[Total No. of Pages : 2

[5155] - 278
M.E. (Computer Network)
RESEARCH METHODOLOGY
(2013 pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Attempt any 5 Questions.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right side indicates full marks.*

Q1) a) Differentiate between research method and research methodology. **[5]**

b) What are intellectual property rights? **[5]**

Q2) a) Explain significance of testing and measurement in research. **[5]**

b) Explain sampling and non sampling errors. **[5]**

Q3) a) What is primary data? Explain in details different data collection techniques. **[5]**

b) Explain hypothesis formulation in details. **[5]**

OR

Q4) a) Explain in detail different factors affecting the research design. **[5]**

b) Explain non parametric Test procedure, list out its advantages and disadvantages. **[5]**

Q5) a) Explain skewness and kurtosis measure. **[5]**

b) Explain multivariate techniques and explain important characteristics of any one of such techniques. **[5]**

P.T.O.

Q6) Write short notes on :

a) Objectives of research.

[5]

b) Chi-square tests.

[5]



Total No. of Questions : 8]

SEAT No. :

P4031

[Total No. of Pages : 2

[5155] - 279

M.E. (Computer Networks)

NETWORK DESIGN, MODELLING AND ANALYSIS

(2013 Pattern) (Semester - II)

Time : 3 Hour]

[Max. Marks : 50

Instructions to the candidates :

- 1) Answer Any Six questions.
- 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) The probability distribution function for a discrete random variable X is

$$f(x) = 2k, x = 1$$

$$3k, x = 3$$

$$4k, x = 5$$

0, otherwise

where k is some constant.

Find,

i) k.

ii) $P(X > 2)$

iii) $E(X)$ and $Var(X)$ [4]

b) Explain probability distribution for independent events. [4]

Q2) a) Explain Little's Theorem with suitable example. Enlist different applications of Little's Theorem. [4]

b) Explain Occupancy Distribution on Arrival for M/G/1 Queue. [4]

P.T.O.

Q3) Write a shot note on (Any Two) [10]

- a) Reservation and Polling.
- b) Modelling Network as a Graph.
- c) Queues on vacation.

Q4) a) Solve Terminal Assignment problem for given data. [5]

Weight of node = 0l, Max. capacity of concentrator = 03

	G	H	I
a	8	18	12
b	14	16	14
c	12	19	17
d	23	18	12
e	34	13	14
f	12	12	12

b) Explain Bin Packing algorithm with suitable example. [3]

Q5) a) Explain Router Design with suitable diagram. [4]

b) Describe Multipoint line layout heuristics in detail. [4]

Q6) a) Differentiate TCP and UDP. [4]

b) Explain ESAU-WILLIAMS algorithm with suitable example. [4]

Q7) a) How Network topology affects the performance and reliability of network? [4]

b) Explain different techniques for merging two networks. [4]

Q8) Write a short note on (Any Two) [10]

- a) Parameters for Good design of a network.
- b) Network Equipments.
- c) Research in Network Design.



Total No. of Questions : 8]

SEAT No. :

P4032

[Total No. of Pages : 2

[5155] - 280

M.E. (Computer Engineering)

COMPUTER NETWORKS

Distributed Systems (Semester - II)

(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Solve any 3 questions from question No. 1, 2, 3, 4 and any 3 questions from question No. 5, 6, 7, 8.*
- 2) *Assume Suitable data if necessary.*

Q1) a) Explain issues related to deadlock and discuss any one distributed deadlock detection algorithm. **[4]**

b) Write a note on distributed objects and remote invocation. **[4]**

Q2) a) Explain classification of agreement protocols. **[4]**

b) Explain mutual exclusion in distributed systems with token based and quorum based approach. **[4]**

Q3) a) Explain singnal's dynamic information structure algorithm. **[4]**

b) Explain Suzuki-kasami's broadcast algorithm. **[4]**

Q4) a) Explain ordering of messages. **[4]**

b) Discuss need of computer clock synchronization explain lamport clock. **[5]**

Q5) a) Explain receiver-initiated distributed scheduling. **[4]**

b) Discuss distributed shared memory architecture. **[4]**

P.T.O.

- Q6)** a) Explain synchronous check pointing and recovery. [4]
b) Write short note on mobile & ubiquitous computing. [4]
- Q7)** a) Discuss atomic actions and commit protocol. [4]
b) Write short note on forward error recovery. [4]
- Q8)** a) Explain Java messaging service from JEE architecture. [4]
b) Explain SOAP and UDDI. [5]



Total No. of Questions : 12]

SEAT No. :

P4033

[Total No. of Pages : 2

[5155] - 281
M.E. (Semester - II)
COMPUTER NETWORKS
High Performance Networks
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

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) *Assume suitable data if necessary.*

- Q1)** a) Write a short note on : **[4]**
i) 802.16
ii) MPLS
b) Compare 3G and 4G networks in detail. **[4]**

OR

- Q2)** a) Distinguish between Fast Ethernet and Gigabit Ethernet. **[4]**
b) Explain in detail Design Consideration of High Performance networking.. **[4]**
- Q3)** a) Describe Gigabit Ethernet in detail. **[4]**
b) List and explain applications of Gigabit Ethernet. **[4]**

OR

- Q4)** a) Explain the MAC layer and its devices. **[4]**
b) Write a short note on Full-duplex Ethernet. **[4]**

P.T.O.

- Q5)** a) Explain in detail ATM and its basic principles. [5]
b) Write a short note on ATM Traffic Management. [4]

OR

- Q6)** a) Explain in detail Interworking with ATM. [4]
b) Draw and explain ATM Protocol reference model. [5]

- Q7)** a) Explain in details MPLS and its considerations in the choice of cell Vs frames. [5]
b) Draw the architecture of IP over MPLS and explain its terminologies in detail. [4]

OR

- Q8)** a) Explain any two MPLS Encapsulation Standards. [5]
b) Describe the all possible research areas in MPLS? [4]

- Q9)** a) Write a short note on Broadband wireless networks. [4]
b) Write a note on Wimax standards. [4]

OR

- Q10)**a) Explain physical and MAC layer of Wimax. [4]
b) Distinguish between Fixed broadband wireless network and Mobile broadband wireless network. [4]

- Q11)**a) Write a short note on mobile Wimax. [4]
b) Distinguish between GSM, GPRS and WCDMA. [4]

OR

Q12) Write a short note on :

- a) HSPDA Protocol Stack. [4]
b) UMTS Protocol. [4]



Total No. of Questions : 6]

SEAT No. :

P4034

[Total No. of Pages : 2

[5155] - 282

M.E. Computer Networks (Semester - III)

ADVANCED TCP/IP

(2013 Credit Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt any three question from Q1, Q2, Q3, Q4 and one from Q5, Q6.*
- 2) *Figures to right indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Draw and Explain TCP State transition diagram. [6]
b) Host A uses TFTP to read 2,150 bytes of data from host B. [6]
i) Show all the TFTP commands including commands needed for connection establishment and termination. Assume no error.
ii) Show all the user datagrams exchanged between the two hosts.
- Q2)** a) Differentiate between Rlogin and TELNET. [6]
b) What is need of pull protocol at receiver side? Explain POP3 and IMAP4. [6]
- Q3)** a) User aaa@xxx.com sends a message to user bbb@yyy.com. The latter replies. Show all SMTP commands and responses. [6]
b) Explain TCP Tahoe and TCP Vegas. [6]
- Q4)** a) Explain the role of IKE Key management w.r t. security. [6]
b) Write short note on TCP Westwood and TCP Jersey. [6]

P.T.O.

- Q5)** a) Explain following protocols [7]
i) AODV
ii) DSDV
b) Explain performance of TCP in mixed wired and wireless environment. [7]
- Q6)** a) Explain phases of key management in IPsec. [7]
b) Why FTP requires two TCP connections ? Explain scenario where FTP or TFTP is preferred. [7]



Total No. of Questions : 12]

SEAT No. :

P4035

[Total No. of Pages : 2

[5155] - 283

M.E. (Computer Networking)
System Operations and Maintenance
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt Q. No. 1 or 2, Q. No.3 or 4, Q. No. 5 or 6, Q. 7 or 8. , Q. 9 or 10., Q. 11 or 12.*
- 2) *Figure to the right indicates full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

Q1) Explain in detail Cisco IOS XR Software. Also explain components of IOS XR Layered High Availability Architecture [9]

OR

Q2) List and explain major functions of operating system. [9]

Q3) What is “TURBOBOOT”? Give the steps needed to boot the IOS XR software on a router. [8]

OR

Q4) What is two stage configuration model? Explain with suitable example.[8]

Q5) What is SNMP? Which different versions of SNMP those are supported by Cisco IOS XR software? Also explain basic steps are needed to configure SNMP on an IOS XR router. [8]

OR

Q6) What is the role of ACS server? Explain how IOS XR router is connected to ACS server. [8]

P.T.O.

Q7) Compare IPv4 and IPv6 models. Also list 4 different types of Interior Gateway Protocol (IGP), Explain any two in details. [8]

OR

Q8) How IS-IS protocol implements connectionless network service? Illustrate. [8]

Q9) Draw and explain Cisco IOS XR MPLS Architecture. Also explain following MPLS Label Operations: Push, Pop, De-aggregate, Swap and push. [8]

OR

Q10) List and explain silent features of Label Distribution Protocol (LDP). Also draw and explain Cisco IOS XR MPLS Architecture. [8]

Q11) Explain different components of SDR Shared Resources. Give step by step configuration of Secure Domain Router. [9]

OR

Q12) Explain Functionalities of Three-Stage Fabric Links and Multi module Configuration in IOS XR 3.5. [9]



- b) Show that $C = \{0000, 1100, 0011, 1111\}$ is a linear code. What is the minimum distance? [5]
- c) For the code $C = \{00000, 10101, 01010, 11111\}$ construct the generator matrix. Since this G is not unique, suggest another generator matrix that can also generate this set of codewords. [5]

Q3) Solve any two :

- a) Consider the elements defined in the universes X and Y as follows:
 $X = \{2,4,6\}$ and $Y = \{p,q,r\}$. Find the Cartesian product of these sets, also find subset and draw coordinate diagram for the subset. [5]
- b) Obtain the value of median from the following data of the monthly income of 10 employees of a company in Rs. 4391, 5384, 5591, 5407, 6672, 6522, 6777, 6753, 7850, 7490 [5]
- c) Write short notes on the following [5]
 - i) Additive property of Chi-square
 - ii) Chi-square as a test of 'goodness of fit'

Q4) Solve any two

- a) Find the average rate of increase in population which in the first decade has increased by 20%, in the second decade by 30% and in the third decade by 40%. [5]
- b) The theory predicts the proportion of beans, in the four groups A,B,C, and D should be 9:3:3:1. In an experiment among 1600 beans, the number in the four groups were 882,313,287 and 118. Does the experiment result support the theory? Apply chi square test. [5]
- c) Explain Hamming and Lee Metrics with example. [5]

Q5) Solve any two

- a) Explain Parity check code and parity check matrices with example.[5]
- b) The number of automobile accidents per week in a certain community were as follows: 12,8,20,2,14,10,15,6,9,4 Are these frequencies in agreement with the belief that accident conditions were the same during the 10 week period under consideration? [5]
- c) Find the minimum spanning tree for the graph from Q1 a) using Kruskal's algorithm. [5]



P4040

[Total No. of Pages : 2

[5155] - 285
M.E. (Information Technology)
APPLIED ALGORITHMS
(2013 Pattern) (Semester - I)

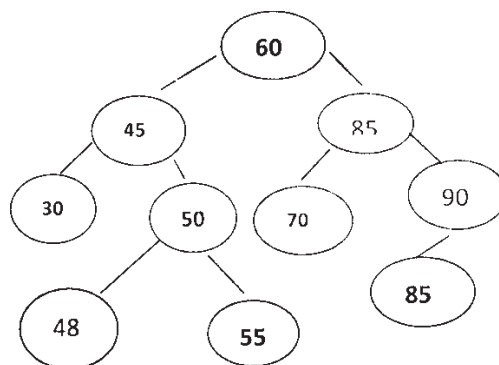
*Time : 3 Hours]**[Max. Marks :50**Instructions to the candidates:*

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) Explain Tiling problem. Prove by mathematical induction that tiling problem can always be solved. [5]
 b) Prove by contradiction that $\sqrt{2}$ is irrational. [3]
 c) Explain CCW test and give an example where it is used. [2]

- Q2)** a) Give steps for finding out the complexity for recursive algorithm. Give recursive algorithm for binary search and find out its complexity by solving the recurrence of the same. [6]
 b) Solve following recurrence [4]
 $T(n) = n$ if $n = 0,1,2$
 $= 5t_{n-1} - 8t_{n-2} + 4t_{n-3}$ otherwise

- Q3)** a) Explain the term Persistent data structure. Write C code to delete the item from singly linked list in persistent manner. Show the diagrams before and after deletion. [6]
 b) Give the algorithm for delete operation on splay tree and then perform delete operation on following self-balancing splay tree at item 55. [4]

**P.T.O.**

- Q4)** a) What is the preprocessing step required for Graham Scan algorithm? Explain with example how a wrong convex hull is generated if preprocessing step not fulfilled. [5]
 b) Give an algorithm to find the closest pair in 1-Dimension. Comment on its complexity by solving its recurrence. [5]
- Q5)** a) Write the dual of following LP. [6]
 Maximize $Z = f(x,y) = 3x + 2y$
 subject to: $2x + y \leq 18$
 $2x + 3y \leq 42$
 $3x + y \leq 24$
 $x \geq 0, y \geq 0$
 Find the optimal solution for primal and dual.
 b) Explain with figures zig-zag and zig operations on splay tree. [4]
- Q6)** a) Give randomized algorithm for pattern matching minimum spanning tree. [5]
 b) Prove by mathematical induction that the function given below will always return square of the no, passed as input parameter. [5]
 int sq(n)
 {
 if (n==0) return 0;
 else return (2n + sq(n-1) -1);
 }
- Q7)** a) Give parallel algorithm for list ranking. Explain with figure. Comment on its complexity. [5]
 b) What is triangle inequality? Give approximation algorithm for TSP. Also prove that it is polynomial time 2 approximation algorithm. [5]
- Q8)** a) Create a B-tree of degree 2 with following data. Draw the tree at each stage. [5]
 5, 10, 8, 7, 9, 25, 20, 22, 45, 40, 30, 35
 b) Give online algorithm for bipartite matching problem and m machine problem [5]



Total No. of Questions : 8]

SEAT No. :

P4041

[Total No. of Pages : 2

[5155] - 286

M.E. (Information Technology)
ADVANCED OPERATING SYSTEMS
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Solve any five questions from 8 questions.*
- 2) *Figures to the right hand indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data wherever necessary.*

- Q1)** a) Explain the following UNIX system calls Fork, Wait, Waitpid and Exit. [4]
b) Differentiate between program and process. [3]
c) How is the program loaded into processes? [3]
- Q2)** a) Explain user-level threads. [4]
b) Explain many-to-one thread implementation mechanism with example [3]
c) What is the condition variable in Linux. [3]
- Q3)** a) Explain two-level page table with example. [5]
b) What is thrashing? Explain the concept of global pool and local pool [3]
c) What is a page? [2]
- Q4)** a) Explain the data block allocation for UNIX's S5FS. [4]
b) Enlist the OS issues for the virtual memory management. [4]
c) What do you mean by journaling? [2]

P.T.O.

- Q5)** a) What is distributed operating system? [2]
b) Differentiate between logical and physical clock synchronization. [4]
c) Explain any two types of transparency mechanisms in distributed system. [4]
- Q6)** a) What is consistency in DSM? Explain any two consistency models with example. [5]
b) Explain any one type of election algorithm in distributed system. [3]
c) Explain any two desirable features of Message Passing in distributed system. [2]
- Q7)** a) What are different load estimation policies in distributed operating systems? [5]
b) Explain the features of global scheduling algorithm. [5]
- Q8)** a) Write a short note on load transfer policies. [5]
b) Write a short note on Optimal task assignment. [5]



Total No. of Questions : 8]

SEAT No. :

P4043

[Total No. of Pages : 2

[5155] - 288

M.E. (Information Technology) (Semester -II)

WIRELESS COMMUNICATION TECHNOLOGIES

(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Assume suitable data if necessary.*
- 2) *Answer any 5 out of 8 questions.*
- 3) *Figures to the right indicate full marks.*

- Q1)** a) Explain the working of On-Demand Distance Vector Routing algorithm. [5]
- b) How ZRP reduces the control overhead in: [5]
- RouteRequest flooding mechanism employed in on-demand approaches
 - The periodic flooding of routing information packets in table-driven approaches
- Q2)** a) Compare tree-based and mesh-based multicast routing protocol. [5]
- b) Explain the architecture of a PRNET. [5]
- Q3)** a) Explain Adaptive Shared Tree Multicast Routing Protocol w.r.t: [5]
- i) Tree initialization phase
 - ii) Tree maintenance phase
- b) Write advantages and disadvantages of Location Aided Routing protocol. [5]
- Q4)** a) Why does TCP not perform well in ad-hoc wireless networks? [5]
- b) Which routing protocol uses a link-reversal algorithm and provides loop-free multicast path to destination node. Explain. [5]

P.T.O.

- Q5)** a) List Type1- and Type2- update messages used in predictive location-based QoS routing protocol. [5]
b) What are the pros and cons of assigning the responsibility of end-to-end reliability at the application layer? [5]
- Q6)** a) Explain need for energy management in ad-hoc wireless networks. [5]
b) Explain the reference architecture of multicast routing protocol. [5]
- Q7)** a) Describe in brief generalized pulse discharge PAMAS protocol. [5]
b) Discuss the INORA QoS Frameworks for ad-hoc wireless network. [5]
- Q8)** a) Explain various energy management Issues in ad-hoc networks. [5]
b) How security aware AODV protocol provides solution against black-hole attack? [5]



Total No. of Questions : 8]

SEAT No. :

P4044

[Total No. of Pages : 2

[5155] - 289

M.E. (Information Technology) (Semester - II)

ADVANCE DATABASE SYSTEMS

(2013 Credit Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Answer any five questions.*
- 2) Neat figures must be drawn whenever necessary.*
- 3) Make suitable assumptions whenever necessary.*
- 4) Figure to the right indicate full marks.*

- Q1)* a) What is Autonomy? Explain three dimensions along which autonomy can be specified. [5]
b) Explain Framework of Distribution in distributed database Design.[5]
- Q2)* a) Explain in detail Failures in Distributed DBMS. [5]
b) What do you mean by localization of distributed data. [5]
- Q3)* a) Explain the main categories of concurrency control mechanisms. [5]
b) Define false cycles? Explain False cycles with an example. [5]
- Q4)* a) Define Serializability. Explain View Serializabilty and conflict Serializabilty with an example. [5]
b) Define Reliability. Discuss chain of events leading to a system failure with a neat diagram. [5]
- Q5)* a) With a neat diagram explain General Architecture of a Parallel Database System. [5]
b) Discuss Intra-Query Load Balancing with a example. [5]

P.T.O.

- Q6)** a) Discuss object servers and page servers Architecture with a neat diagram. [5]
b) Explain Horizontal Class Partitioning. [5]
- Q7)** a) Explain Architecture of typical data mining system With a neat diagram. [5]
b) Explain with a neat diagram Information flows of a data warehouse. [5]
- Q8)** a) Explain Conceptual Modeling of Data Warehouses with example. [5]
b) Explain Decision Tree Algorithm with an example. [5]



Total No. of Questions : 8]

SEAT No. :

P4045

[Total No. of Pages : 2

[5155] - 290

M.E. (Information Technology) (Semester - II)
ADVANCE COMPUTER ARCHITECTURE
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) Discuss different levels of available functional parallelism in detail with neat diagram. [4]
b) What are the basic parallel techniques in parallel processing? Explain in brief. [2]
c) Explain Concurrent Execution Models for Parallel Processing. [4]
- Q2)** a) What is a Data Hazard? Explain any two Data Hazards with example.[4]
b) Explain the role of Dynamic Scheduling in exploiting ILP. [2]
c) Explain differences between Hardware and Software speculation. [4]
- Q3)** a) Explain the basic compiler techniques for exposing ILP. [4]
b) Explain multithreading architecture in brief Discuss the support of ILP to exploit thread level parallelism in detail. [4]
c) Discuss Limitations of ILP. [2]
- Q4)** a) Explain Distributed Shared Memory Architecture with neat diagram. What are the limitations of Symmetric Shared Memory Architecture?[4]
b) Explain the Models of Memory Consistency. Also discuss the issues associated with cache coherency in multiprocessor system. [3]
c) What is an Interconnection Network? Explain Multi-Stage Switch configuration for Interconnection Network. [3]

P.T.O.

- Q5)** a) Explain the different hardware approaches in multithreading. [4]
b) Write a note on IBM Cell architecture. [3]
c) Explain the role of Multithreading in improving uniprocessor throughout. [3]
- Q6)** a) Explain DRAM Technology for Memory Optimization in detail. [4]
b) Explain the role of Virtual Memory in providing protection for memory optimization. [4]
c) Explain memory hierarchy design. [2]
- Q7)** a) Write notes on: [5]
i) Computational models
ii) Fine grained SIMD
b) What is Dataflow Architecture? Explain Tagged-token Dataflow Machine approach in Dataflow Architecture. [5]
- Q8)** a) Explain Multicore Organization in detail. Also explain the following configurations for Multicore Processor: [5]
i) Shared L2 Cache
ii) Shared L3 Cache
b) Discuss different multi core memory issues. [5]



Total No. of Questions : 8]

SEAT No. :

P4046

[Total No. of Pages : 2

[5155] - 291
M.E. (Semester - III)
INFORMATION TECHNOLOGY
Information Assurance and Security
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions from eight questions.*
- 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.*

- Q1)** a) How critical characteristics of information are used in the study of computer security? [5]
b) What is the use of components of C.I.A. triangle? Why is it used in security? [5]
- Q2)** a) Explain the components of an Information Security? Which is the component affected by the study of computer security? [5]
b) What is False Accept Rate and False Reject Rate? Give one example of each. [5]
- Q3)** a) Explain in detail privacy in an information security context? [5]
b) Explain different assets in an organization that require protection. [5]
- Q4)** a) State various uses of computer forensics. [5]
b) Differentiate malware and viruses. Whether Trojan horses carry viruses or worms? [5]
- Q5)** a) How is the policy different from a law? Differentiate between law and ethics? [5]
b) Describe various features of Biometric Access Controls. [5]

P.T.O.

- Q6)** a) State the three types of security policies? Explain its uses. [5]
b) State the situation in which the result of computer forensics is used. [5]
- Q7)** a) Enlist various types of cybercrimes. [5]
b) Differentiate between honeypot and a honeynet? [5]
- Q8)** a) How to identify risks? What is the role of assets and vulnerabilities in the risk management process? [5]
b) Explain various generations of firewall technology which are still in common use? [5]



Total No. of Questions : 8]

SEAT No. :

P4047

[Total No. of Pages : 3

[5155] - 292

M.E. (Semester - III)

INFORMATION TECHNOLOGY

Network Programming

(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) List out different types of messages exchanged across a routing socket with brief descriptions. [2]
- b) With suitable diagrams describe different scenarios when connection is established and terminated using three way handshaking. [4]
- c) List different states used to describe the operation of TCP in state transition diagram. Also explain each state with diagrammatic representation in brief. [4]
- Q2)** a) How TCP concurrent server works while processing different requests from the clients? Write the pseudo code showing concurrent server handling multiple clients requests. [4]
- b) Explain in brief about byte ordering used in the client server communication over a TCP network. [2]
- c) Write the address structure of generic socket. With suitable diagram do the comparison of various socket address structures. [4]

P.T.O.

- Q3)** a) Discuss about the packets exchanged by client and server during connection establishment and termination. [4]
- b) Explain about the requirements of byte manipulation functions in socket communications. With proper prototype describe bzero() function used in byte manipulation. [4]
- c) Explain the working of active open and passive open in TCP client / server communication. [2]
- Q4)** a) With clear diagrammatic representation describe Ipv6 server on dual-stack host. [4]
- b) With appropriate prototype explain socket() and socketpair() functions. Write a program to send a message “Network Programming” from client to server using socket function. [3]
- c) SNTP is used to synchronize clocks across a WAN or a LAN, how it works to provide clock synchronization in communication? Give some examples of NTP packet formats used for synchronization. [3]
- Q5)** a) With an example describe how multicasting and broadcasting are used in the LAN. Also give a practical application where IP broadcasting is used. [4]
- b) Write different steps Ipv6 server uses in handling of Ipv4 TCP clients. [3]
- c) With appropriate diagrammatic representation explain about sending of multicast packets on a WAN. [3]
- Q6)** a) Discuss the existence of TIME - WAIT state with an example showing network applications. [4]
- b) Describe the working of resolvers along with clients and name servers with appropriate diagrammatic representations. [4]
- c) Write in brief about the working of DNS to map between hostname and IP address. [2]
- Q7)** a) Write a program using POSIX thread to implement echo server using one thread per client. Program should contain clear comment about the functions used in the program. [5]
- b) Discuss the pros and cons of the network application implemented with multiple threads and with multiple processes to handle client requests. Also describe the working of pthread_create() and Pthread_join() with examples. [5]

- Q8)** a) With appropriate comments write a process based concurrent server program where one child process is created to process per client's request. **[5]**
- b) Write a program using socket() system call in which client sends a message "Network Programming" to the server. Server converts all lowercase characters into uppercase characters (ex: "NETWORK PROGRAMMING") and transfers back to the client. **[5]**



Total No. of Questions : 8]

SEAT No. :

P4048

[Total No. of Pages : 2

[5155] - 293
M.E. (Chemical)
MATHEMATICAL AND STATISTICAL METHODS
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any 5 questions.*
- 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.*

Q1) a) Solve the differential equation using power series **[5]**

$$y' - y = 0$$

$$y'' = 2xy$$

b) What is critical point stability. **[5]**

Q2) a) State legendre's equation for general second order linear differential equation and discuss its significance. **[5]**

b) Use the method of characteristics to find the solution of the first order partial difference equation $x^2ux + xyuy = u^2$ Which passes through the curve $u = 1, x = y^2$. Determine where this solution becomes singular. **[5]**

Q3) a) Integrate the following function **[5]**

$$\int_0^{\infty} \frac{dx}{1+x^4} = \frac{\pi}{\sqrt[2]{z}}$$

Use : $Z_1 = e^{\pi i/4}, Z_2 = e^{3\pi i/4}, Z_3 = e^{-3\pi i/4}, Z_4 = e^{-\pi i/4},$

b) Obtain the Laplaces equation in two dimensions for heat flow. **[5]**

P.T.O.

Q4) a) A class consists of 80 students, 25 of them are girls and 55 boys, 10 of them are rich and remaining poor, 20 of them are fair complexioned. What is the probability of selecting a fair complexioned rich girl. [5]

b) Growth of bacteria (N) in a culture after 1 hr. is given in the 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 $t = 7$ using least square method. [5]

Q5) a) Obtain spearman's formula for rank correlation coefficient. [5]

b) Explain correlation and regression analysis. [5]

Q6) a) Write the equations to find the sum of the squares for two way analysis of variance. [5]

b) What types of errors are associated in testing hypothesis. [5]

Q7) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test the hypothesis that the true variances are equal, against the alternative that they are not, at the 10% level

[Assume that $P(F_{10,8} \geq 3.35) = 0.05$ and $P(F_{8,10} \geq 3.07 = 0.05)$] [10]

Q8) a) State the steps in constructing latin square. [5]

b) Distinguish between statistics and parameters. [5]



Total No. of Questions : 8]

SEAT No. :

P4049

[Total No. of Pages : 2

[5155] - 294
M.E. (Chemical)
PROCESS OPTIMIZATION
(2013 Pattern) (Theory)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer total 5 questions from following*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Find whether the following function is strictly convex / strictly concave

$$f(x) = 6x_1^2 + 8x_1x_2 + 10x_1 - 3x_2 - 9x_2^2 + 5 \quad [5]$$

- b) Write the general procedure for solving optimization problems. [3]
- c) Explain Concavity of a function. [2]

Q2) a) Give the classification of optimization problems. [5]

- b) Write a note on Degree of Freedom. [3]
- c) Explain the terms Local optima and Global optima. [2]

Q3) a) Minimize $f(x) = 2x_1^2 + 5x_2^2 + 8$ starting at $(x^0)^T = [3 \ 2]$ in the direction $s^0 = [-3 \ -2]^T$ using simplex search method. Perform 2 iterations. [5]

- b) Find whether the given direction s at the point x is descent for the function

$$f(x_1, x_2) = x_1^4 + x_2^3 - 2x_1^2 x_2^2 + 10x_1 \quad s = (-1, 2)^T, \quad x = (0, 1)^T \quad [3]$$

- c) Write a note on -Unidirectional Search. [2]

P.T.O.

- Q4)** a) Maximize $f = 4x_1 + 3x_2 + 6x_3$ subject to
 $2x_1 + 3x_2 + 2x_3 \leq 440$, $4x_1 + 3x_3 - x_3 \leq 470$, $2x_1 + 5x_2 \leq 430$, $x \geq 0$,
 $i = 1,2,3$. Use Simplex method. [5]
- b) Explain Kuhn-Tucker conditions. [3]
- c) Write a note on- Penalty Function Method. [2]
- Q5)** a) Explain Lagrange Multiplier method. [5]
- b) What is Quadratic Programming? [3]
- c) Write a short note on- Complex search method. [2]
- Q6)** a) Explain working principles for Genetic Algorithm. [5]
- b) What are Genetic Algorithm Operators? [3]
- c) What are the similarities between Genetic Algorithm and traditional methods? [2]
- Q7)** a) Minimize $f(x) = 5x^4 - 3x^3 + 2x^2 + 40$ in the interval $[-5 \ 5]$. Use Golden Search Method. Demonstrate at least 2 steps towards finding optimized solution for the above function. [5]
- b) Secant Method [5]
 Write complete algorithm for these methods and demonstrate at least 3 steps towards finding optimized solution for the above function.
- Q8)** a) Minimize $f(x) = 2x^2 + (12/x)$. Use Fibonacci Search Method, Perform 2 iterations. [5]
- b) Use Internal halving Method for above function. Perform 2 iterations. [5]



Total No. of Questions : 8]

SEAT No. :

P4050

[Total No. of Pages : 2

[5155] - 295
M.E. (Chemical)
ADVANCED SEPARATION PROCESSES
(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) What are recent advances in separation techniques based on size, surface properties and ionic properties? [5]
b) What is cross flow filtration? What are its advantages over dead end filtration? [5]
- Q2)** a) Discuss details of spiral wound module with typical schematic diagram? [5]
b) Explain the design aspects of microfiltration? [5]
- Q3)** a) Discuss in brief about the design procedure of adsorption column ?[5]
b) Discuss various Recent Advances and Process Economics of Analytical Separation? [5]
- Q4)** A spiral wound membrane used for concentrating apple juice by reverse osmosis was first tested with pure water at temperature from 20 °C to 40 °C. The flux was proportional to transmembrane pressure for pressure up to 3 MPa, and the slope changed with the temperature as shown in following table. [10]
a) Does the permeability vary with T/μ , as suggested by Wilke-Chang equation, or with some other function of T , μ and ρ

P.T.O.

- b) What is the effective activation energy transport of water throughout the membrane?

T(°C)	20	25	30	35	40
Slope L/h.m ² , MPa	28.26	31.87	37.17	39.74	43.08

- Q5)** a) Discuss ion exchange selectivity in binary system. Derive relevant expression. [6]

- b) Explain different types of equipment employed for electrophoresis? [4]

- Q6)** a) Elaborate the various controlling factors of ionic separations? [5]

- b) Write a short note on foam fractionation? [5]

- Q7)** a) Discuss Principle, working and application of Reactive Distillation? [6]

- b) What are the modern techniques used for Industrial effluent treatment and discuss one of the technique? [4]

- Q8)** a) Describe principle, working and applications of following extraction techniques: [6]

i) Ultrasound assisted extraction

ii) Microwave assisted extraction

- b) Write a short note on oil spill waste minimization and management? [4]



Total No. of Questions : 8]

SEAT No. :

P4051

[Total No. of Pages : 2

[5155] - 296

M.E. (Chemical)

RESEARCH METHODOLOGY

(2013 Credit Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Solve any five full questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) How a R&D project can be planned well? **[5]**
b) Discuss the aspects of success of a research project Vs a typically planned engineering / construction project? **[5]**
- Q2)** a) From highly inefficient technologies related to energy saving, they are becoming efficient ones. Explain the component of research in this sector of Chemical Engineering. **[5]**
b) From the research point of view discuss developments in Process Intensification Technology. **[5]**
- Q3)** a) What are PERT & CPM techniques? **[5]**
b) Write a note on impact of presentation. What are the elements of effective presentation? **[5]**
- Q4)** a) How according to you the chemical engineering research is poised for development in the coming decade, especially in the context of interdisciplinary research areas. **[5]**
b) Write a note on “Process for patenting a research idea”. **[5]**

P.T.O.

- Q5)** a) What are the typical financial needs of a research project on a process modification of a known chemical process? [5]
b) Write a note on “Plagiarism in research”. [5]
- Q6)** a) Every rupee spent on research has to be recovered from the market. Discuss various methods of this recovery. [5]
b) Why report writing is essential? [5]
- Q7)** a) Write a note on ‘Pollution free technologies’. [5]
b) What is the status of research & development in Indian Chemical Industry? [5]
- Q8)** a) Write a note on Mathematical modeling advancement’. [5]
b) Discuss the steps involved in publishing a research article. [5]



Total No. of Questions : 8]

SEAT No. :

P4052

[Total No. of Pages : 2

[5155] - 297
M.E. (Chemical Engineering)
ADVANCED TRANSPORT PHENOMENA
(2013 Pattern) (Theory)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer 5 questions from 8 questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of electronics calculator is allowed.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use equations in appendix wherever necessary*

Q1) Obtain an expression for the mass flow ω for an ideal gas in laminar flow in a long circular tube. The flow is presumed to be isothermal. Assume that the pressure change through the tube is not very large, so that the viscosity can be regarded as constant throughout. **[10]**

Q2) a) Derive the equation of continuity over the fixed volume element of Δx , Δy , and Δz through which laminar flow is flowing. **[5]**
b) Write the physical significance of the **[5]**
i) Navier Stokes Equation,
ii) Creeping flow equation. and
iii) Euler equation

Q3) A semi infinite body of liquid with constant density and viscosity is bounded below by horizontal surface (the xz plane). Initially the fluid and the solid are rest. Then at time $t=0$ the solid surface is set in motion in the positive x direction with velocity v_0 . Find velocity V_x as a function of y and t . There is no pressure gradient or gravity force in the x -direction and the flow is presumed to be laminar. **[10]**

Q4) A spherical nuclear fuel element consist of a sphere of fissionable material with radius R^F surrounded by a spherical shell of aluminum cladding with outer radius R^C . Inside the fuel element, fission fragment produced that have very high kinetic energies. Collision between these fragments and the atoms of the fissionable material provided the major source of thermal energy

P.T.O.

in the reactor. Such a volume source of thermal energy resulting from nuclear fission is S_n (cal/cm²s). This source will not be uniform throughout the sphere of fissionable material. Obtain the expression of temperature profile in cladding and fissionable sphere. Assume

$$s_n = s_{n0} \left[1 + b \left(\frac{r}{R^F} \right)^2 \right]$$

S_{n0} : volume rate of heat production at the centre of sphere and b is dimensionless positive constant. [10]

- Q5)** a) Describe the procedure for solving the steady state problems using the equation of change for non-isothermal systems. [4]
 b) Obtain the expression for dimensionless analysis of the equation of change for non-isothermal systems. [6]

Q6) A solid material occupying the space from $y=0$ to $y=\infty$ is initially at temperature T_0 . At time $t=0$, the surface at $y=0$ is suddenly raised to temperature T_1 and maintained at that temperature for $t > 0$. Find the time-dependent temperature profile. δ flows slowly past the top of the tube, to maintain the mole fraction of A at x_{A2} for $z=z_2$. the entire system kept at constant temperature and pressure. Gases A and B assumed to be ideal. Obtain the mole fraction profile in the system, average concentration profile, and rate of mass transfer at the interface. [10]

- Q7)** a) Write note on the time smooth velocity. [3]
 b) Convert the equation of change for non-reacting binary mixture into dimensionless form. [7]

Q8) Develop expression for the mole fraction profile $X_A(y)$ and the temperature profile $T(y)$ for system shown in figure. the mole fractions and temperatures at both film boundaries ($y=0$ and $y=\delta$). A hot condensable vapor A is diffusing at steady state through a stagnant film of non-condensable gas B, to cold surface at $y=0$, where A condense. Assume ideal gas behavior and uniform pressure. Furthermore assume the physical properties to be constant, evaluated at some measure and temperature and composition, Neglect radiative heat transfer. [10]



P4053

[Total No. of Pages : 3

[5155] - 298

M.E. (Chemical Engineering) (End Semester)

ADVANCED PROCESS CONTROL

(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Attempt any five questions.
- 2) Assume suitable data wherever necessary.
- 3) Draw neat figures wherever necessary.
- 4) Use of Scientific Calculators is allowed.
- 5) Figures to the right indicate full marks.

- Q1)** a) Derive state space model matrix equations for the irreversible reaction $A \rightarrow B$ taking place in two perfectly mixed reactors connected in series. The reaction rate is proportional to the concentration of reactant. Let C_{A1} and C_{A2} are the concentrations of A in tank 1 and tank 2 respectively. The concentration of A in feed is C_{A0} . The feed flow rate is F. Both C_{A0} and F can be manipulated. Assume specific reaction rate constants k_1 and k_2 in each tank to be constants. Further, assume that the reactor is with isothermal operation. [5]
- b) Differentiate between Theoretical and empirical modelling. [3]
- c) Define Process Model [2]
- Q2)** a) Explain the concept of stability in dynamic systems? Explain in terms of pole placements. [5]
- b) Define and explain cascade control system with neat diagram. [3]
- c) Define feed forward control. [2]
- Q3)** a) A certain multivariable system has two outputs y_1 and y_2 , that can be controlled by any of three available inputs m_1 , m_2 , and m_3 . Through pulse testing, the following transfer function model was obtained; [5]

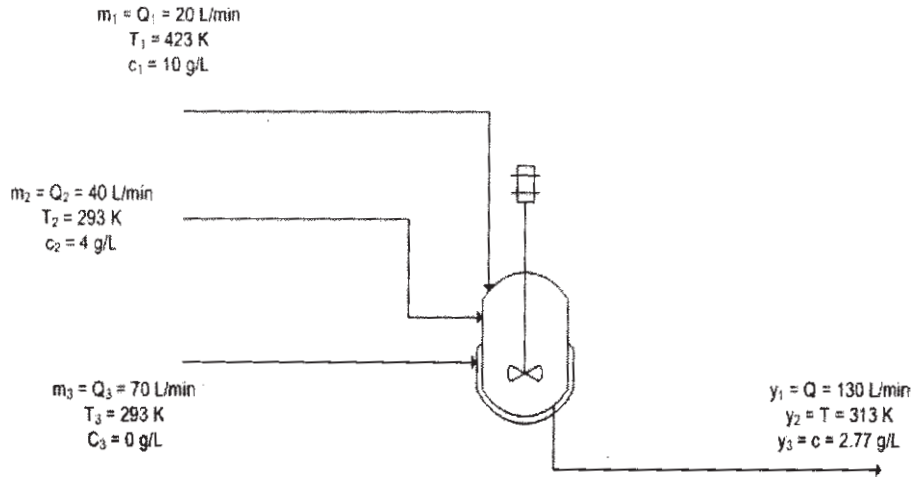
$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} \frac{0.5e^{-0.2s}}{3s+1} & \frac{0.07e^{-0.3s}}{2.5s+1} & \frac{0.04e^{-0.03s}}{2.8s+1} \\ \frac{0.004e^{-0.5s}}{1.5s+1} & \frac{-0.003e^{-0.2s}}{s+1} & \frac{-0.001e^{-0.4s}}{1.6s+1} \end{bmatrix} \begin{bmatrix} m_1 \\ m_2 \\ m_3 \end{bmatrix}$$

Which loop pairing is expected to give the best control?

P.T.O.

- b) Define and explain MIMO system with suitable examples. [3]
 c) What is SISO system. Explain with suitable examples. [2]

Q4) a) Consider the following blending system.



The equation used to model the system are

$$y_1 = m_1 + m_2 + m_3$$

$$y_2 = \frac{T_1 m_1 + T_2 m_2 + T_3 m_3}{y_1} = \frac{T_1 m_1 + T_2 m_2 + T_3 m_3}{m_1 + m_2 + m_3}$$

$$y_3 = \frac{c_1 m_1 + c_2 m_2 + c_3 m_3}{y_1} = \frac{c_1 m_1 + c_2 m_2 + c_3 m_3}{m_1 + m_2 + m_3}$$

Calculate the RGA using the steady-state gain matrix method [5]

- b) How is RGA used for loop pairing? Explain. [3]
 c) What is a main criticism of RGA? [2]

Q5) a) Why key element in digital to analog converter makes it possible to use the Computer for implementing control action effectively? [5]

- b) In what way is the z transform a special case of the Laplace Transform [3]
 c) Define digital control. [2]

Q6) a) What are typical MPC capabilities? Enlist. [5]

- b) Give historical overview of Model predictive control. [3]
 c) Enlist applications of model predictive control. [2]

- Q7)** a) What is plant wide control system? Explain in detail. [5]
b) Differentiate between plant wide control system and single equipment Control system. [3]
c) Mention two properties of z transform. [2]
- Q8)** a) What are the various means by which z transform inverse can be obtained? [5]
b) Differentiate between digital and analog control? [3]
c) What is aliasing? [2]



Total No. of Questions : 8]

SEAT No. :

P4054

[Total No. of Pages : 2

[5155] - 299

M.E. (Chemical)

ADVANCED REACTION ENGINEERING

(2013 Pattern) (Theory)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer total 5 questions from follownig.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) What are heterogeneous catalyzed reactions? Explain with four major manufacturing processes where heterogenous catalyst is used. [5]

b) Describe the steps that take place in a typical catalytic reaction, with a schematic diagram. [5]

Q2) a) Explain single-site, dual-site, and Eley-Rideal mechanisms for surface reactions. [5]

b) Derive the expression for Eley Rideal Model for solid catalysed reaction $A + B \rightarrow P$ with first order rate constant k_1 . [5]

Q3) a) Discuss the Steps in modelling chemical systems with diffusion and reaction? [5]

b) What are E-curves and F curves? Explain in brief. [5]

Q4) a) What is shrinking core model? Derive expression for the concentration vs radius of the un- reacted core with time as parameter. [7]

b) Write a short note on segregated flow model? [3]

P.T.O.

- Q5)** a) Derive expression for overall Effectiveness factor for a first order reaction carried out for a solid catalyst slab ? [5]
 b) Write the mass transfer coefficients in packed beds? [3]
 c) Write a short note on Multiphase reactors? [2]

- Q6)** a) Write a note on internal diffusion vs External diffusion? [5]
 b) Derive the differential equation involved for the diffusional mass transport in the cylindrical catalyst pellet with surface concentration C_{AS} with first order reaction $A \rightarrow B$ occurring inside the catalyst pellet with first order kinetics k_1 . Take usual notations for the terms involved. [5]

Q7) A sample of tracer hytane at 320 K was injected as a pulse to the reactor, and the effluent concentration was measured as a function of time, resulting in the following data:

time (min)	0	1	2	3	4	5	6	7	8	9	10	12	14
C (g/m ³)	0	1	5	8	10	8	6	4	3	2.2	1.5	0.6	0

The measurements represent the exact concentrations at the times listed and not the average values between the various sampling tests.

- i) Construct Figures showing $C(t)$ and $E(t)$ as functions of time. [3]
 ii) Determine the fraction of material leaving the reactor that has spent between 3 and 6 min in the reactor. [4]
 iii) Calculate the mean residence time of the distribution. [3]
- Q8)** a) Explain in brief about slurry reactors? [4]
 b) Write the merits and demerits of fluidized and packed bed reactors? [3]
 c) Write a short note on trickle bed reactor? [3]



Total No. of Questions : 8]

SEAT No. :

P3989

[Total No. of Pages : 1

[5155]-300
M.E. Chemical
PROCESS MODELING AND SIMULATION
(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Assume suitable data if necessary.*
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.*

Q1) Define Model and also explain the need of modeling. [10]

Q2) What is linearity and non linearity? Explain it with suitable example. [10]

Q3) What is the use of Design of experiments? Justify it with example. [10]

Q4) Develop a model for Absorption column. [10]

Q5) Write assumptions for a model of Membrane Reactor & develop a model. [10]

Q6) What is simulation? Explain it with a case study. [10]

Q7) Write note on orthogonal collocation to solve PDEs [10]

Q8) Explain application of optimization pertaining to Distillation. [10]



Total No. of Questions : 8]

SEAT No. :

P3990

[Total No. of Pages : 2

[5155]-301

M.E. (Chemical Engineering) (Semester - III)

ADVANCED THERMODYNAMICS

(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figure to the right side indicates full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Explain the equilibrium in liquid-liquid partially miscible systems and the concepts of UCST and LCST. [5]

b) What is the Wohl's expansion? Explain each term of the equations in detail. [5]

Q2) a) Write the phase rule and Duhem's theorem for the reacting mixture. [4]

b) Acetic acid is esterified with ethanol in liquid phase at 100° C and atmospheric pressure by the reaction: $\text{CH}_3\text{COOH} (1) + \text{C}_2\text{H}_5\text{OH}(1) \rightarrow \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$ Initially if there are 2 moles each of acetic acid and ethanol estimate the mole fraction of ethyl acetate in the reacting mixture at equilibrium. ΔH_f° values are: for ethyl acetate -463,250 J/mol, for ethanol - 277,690 J/mol, for water -285,830 and for acetic acid -484,500 J/mol. ΔG_f° Values are for ethyl acetate -318,280 J/mol, for ethanol -174,780 J/mol, for water -389,900 and for acetic acid -484,500 J/mol. [6]

Q3) a) Define Occupation number, Canonical Ensemble, microstate and microstate. What is the Boltzmann distribution Law? Derive the relevant equation. [5]

b) Derive the relation between probability and entropy. What is the probability that two moles of water originally at 50°C will spontaneously separate into 1 mole of water at 49°C and 1 mole of water at 51°C. $C_p = 75\text{JK}^{-1}/\text{mol}$. [5]

P.T.O

- Q4)** a) Describe the Freezing point depression method. [5]
b) Develop correlation for activity and activity coefficient for asymmetrical strong electrolytes. [5]
- Q5)** a) Explain the phenomena of entropy generation in irreversible thermodynamics. [5]
b) Derive the expression for first law of thermodynamics for open system assuming system behaves irreversible. [5]
- Q6)** a) Derive the barometric formula. [5]
b) What are the different types of transitions? Explain with examples, at least two. [5]
- Q7)** a) Does the radius of curvature of a surface have an effect on thermodynamic properties? Explain with example. [5]
b) Derive the expression for surface tension (γ) in terms of partial derivatives of various thermodynamic properties. [5]
- Q8)** What is the Debey-Huckel theory? [10]



Total No. of Questions : 8]

SEAT No. :

P4055

[Total No. of Pages : 2

[5155] - 302

M.E. (Environmental Engineering) (Chemical)
APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERS
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) Discuss spearman's rank correlation coefficient. **[5]**
b) Explain residual error in regression model. **[5]**

- Q2)** a) Calculate karl pearson coefficient of correlation taking deviations from actual mean 52 (X series) and 44 (Y series) **[5]**

X series	44	46	46	48	52	54	?	56	60	60
Y series	36	40	42	40	?	44	46	48	60	52

- b) Explain in detail correlation and autocorrelation with examples and plots. **[5]**
- Q3)** a) Explain convexity of the frequency related to kurtosis. **[5]**
b) Discuss relation between moments about mean in terms of moments about any point. **[5]**
- Q4)** a) Write the equations to find the sum of the squares for two way analysis of variance. **[5]**
b) Find the covariance of two random variables whose joint density is given by. **[5]**

P.T.O.

- Q5)** a) Explain convexity of the frequency curve related to kurtosis. [5]
b) State and explain the assumptions in the analysis of variance. [5]
- Q6)** a) Explain the stepping stone method. [5]
b) Explain tests of significance for attributes. [5]
- Q7)** a) Explain graphical method for sequential sampling. [5]
b) What is transportation algorithm. [5]
- Q8)** a) What is the function of minimum ratio rule in the simplex method. [5]
b) Explain randomized block design model. [5]



Total No. of Questions : 8]

SEAT No. :

P4056

[Total No. of Pages : 2

[5155] - 303

M.E. (Environmental Engineering)

ENVIRONMENTAL MANAGEMENT

(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) What are different factors affecting Anthro-centric and Eco-centric approaches to development. [5]
b) Discuss Ecosystem and role of environmental policies. [5]
- Q2)** a) What are the subsystems of Environment. What is its impact on business. [5]
b) What is 74th amendment of the constitution. [5]
- Q3)** a) Explain Socio-economic aspects of sustainable development. [5]
b) What are the directive principles of state policy. [5]
- Q4)** a) Explain command and control regulation. [5]
b) What are different environmental Acts. [5]
- Q5)** a) Explain a general procedure for risk assessment. [5]
b) Discuss various environmental taxes. [5]
- Q6)** a) How the rule is notified. [5]
b) Write note on factory act. [5]

P.T.O.

- Q7)** a) Explain Kyoto protocol. [5]
b) What is carbon trading. [5]
- Q8)** a) What role is played by ministry of environment and forest in conservation of Environment. [5]
b) Discuss general features of the Annual report of the ministry of environment and forest for the current year. [5]



Total No. of Questions : 8]

SEAT No. :

P4036

[Total No. of Pages : 1

[5155] - 304
M.E. (Chemical Environmental)
ENVIRONMENTAL CHEMISTRY
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any 5 questions.*
- 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.*

- Q1)* What are Colloids? Explain the use of colloids in Environmental Engineering with suitable example. **[10]**
- Q2)* Explain the Fate of chemicals in aquatic environment. **[10]**
- Q3)* Discuss greenhouse gases and global warming. **[10]**
- Q4)* What are the ill effects of particulate matter on human health.? **[10]**
- Q5)* How to remove the Metals from wastewater by using sorption.? **[10]**
- Q6)* Explain chemical and photochemical reactions. **[10]**
- Q7)* Explain Nano materials and its use in water treatment. **[10]**
- Q8)* How to do the Reclamation of contaminated land. Explain it for petrochemical industry? **[10]**



Total No. of Questions : 8]

SEAT No. :

P4057

[Total No. of Pages : 2

[5155] - 305

M.E. (Environmental Engineering)

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

Solve any five full questions.

- Q1)** a) Enlist various types of Research and discuss Applied Research with example. [5]
b) Discuss the general format of a research proposal. [5]
- Q2)** a) “Research provides the basis for nearly all government policies in our economic system. Explain. [5]
b) Explain the precautions to be taken while writing a research report. [5]
- Q3)** a) Write a note on “Internet as a source of Literature survey”. [5]
b) Explain the characteristics of a good sample design. [5]
- Q4)** a) Explain the various sources of error in measurement. [5]
b) “A good literature review serves to narrow the problem itself as well as the technique that might be used”. Explain. [5]
- Q5)** a) Explain Type I and Type II error in testing hypothesis. [5]
b) Write a note on ‘Important characteristics of Chi-Square test’. [5]
- Q6)** a) Enlist non-parametric tests for hypothesis testing. [2]
b) Enlist Important Non-Parametric tests for Hypothesis testing and explain. [8]

P.T.O.

Q7) a) Discuss the important factors to be considered during presenting a research idea. **[5]**

b) Write a note on “Patenting a research idea”. **[5]**

Q8) Write a research proposal for a suitable research problem (any problem related to Civil engineering can be considered) to a funding agency with reference to the following terms:

Title, Introduction, origin of the problem, expected outcome, literature review, Significance of the study in the context of current status, objectives, methodology, year wise plan. **[10]**



Total No. of Questions : 8]

SEAT No. :

P4058

[Total No. of Pages : 2

[5155] - 306

M.E. Environmental Engineering (Chemical)

WASTEWATER TREATMENT & DESIGN

(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any 5 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.*

- Q1)** a) Explain various types of reactions. [5]
b) What are mass transport processes. [5]
- Q2)** a) Discuss the difference between ideal and nonideal reactors. [5]
b) Explain reaction kinetics in detail. [5]
- Q3)** a) Explain PSA in the process of adsorption. [5]
b) State the classification of filtration system. [5]
- Q4)** a) Discuss general features of a conventional rapid granular medium depth filters. [5]
b) Explain the area requirement based on single batch test using hindered interface settling curves. [5]
- Q5)** a) What do you mean by ideal disinfectant. [5]
b) What is UV disinfection. [5]

P.T.O.

Q6) a) Estimate the chlorine dose needed to disinfect a filtered secondary effluent assuming a shoulder effect exists and that the following conditions apply.

Effluent total coliform count before disinfection = $10^7/100$ ml

Required summer effluent total coliform count = $23/100$ ml

Required winter effluent total coliform count = $240/100$ ml

Initial effluent chlorine demand = 4 mg/l

Demand due to decay chlorine contact = 2.5 mg/l

Required chlorine contact time = 60 min [5]

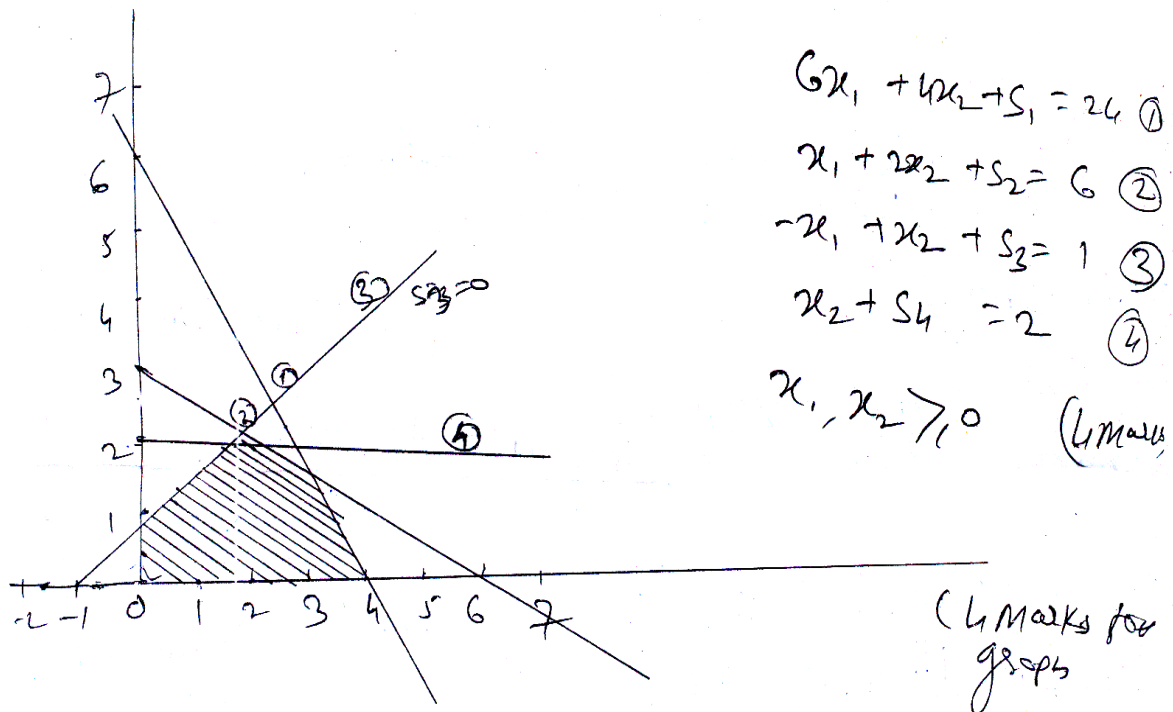
b) Explain the applications of ion exchange for hardness and TDS removal. [5]

Q7) a) Discuss different types of biological treatment processes. [5]

b) What are different types of anaerobic reactors. [5]

Q8) a) Discuss process kinetics and design considerations in biological processes. [5]

b) Explain principle and working of trickling filter. [5]



Total No. of Questions : 8]

SEAT No. :

P4037

[Total No. of Pages : 2

[5155] - 307

M.E. (Chemical Environmental)

SOLID WASTE MANAGEMENT

(2013 Pattern)

Time :3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any 5 questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables slide rule, Moller charts, and electronic pocket calculator and steam table is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) Discuss the Objectives, of Solid waste management in detail. **[10]**

Q2) Explain the routing guidelines to formulate a suitable route for collection vehicles. Investigate the routing pattern for one way street collection and three block configuration. **[10]**

Q3) Discuss on typical material recovery. How the Sorting operations are carried out? **[10]**

Q4) Discuss Energy recovery from solid waste. **[10]**

Q5) Write, what is meant by Composting in detail? **[10]**

Q6) Describe the possibilities in solid waste management with respect to reduction, reuse and recovery. **[10]**

P.T.O.

Q7) Write, what are the factors which affect production of leachate and landfill gas in the landfill? **[10]**

Q8) Describe & list the various environmental legislation for municipal solid waste. **[10]**



Total No. of Questions : 8]

SEAT No. :

P4038

[Total No. of Pages : 1

[5155] - 308

M.E. (Chemical Environmental Engg.)

Industrial Waste Treatment

(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Answer any 5 questions.*
- 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.*

Q1) What is effluent. Explain role of Good Housekeeping in industrial waste Treatment. [10]

Q2) Explain the Neutralization. [10]

Q3) Discuss the Treatment techniques for removal of cyanide in industrial wastewaters. [10]

Q4) What are the Biological treatments available for industrial waste? [10]

Q5) Explain the working of CETP. [10]

Q6) Write the Classification of industries according to pollutants. [10]

Q7) Explain the types of water pollutants in detail. [10]

Q8) Explain the wastewater treatment for tanning industry. [10]



Total No. of Questions : 8]

SEAT No. :

P4059

[Total No. of Pages : 2

[5155] - 309

M.E. (Chemical) (Semester - III)

ENVIRONMENTAL ENGINEERING

Remote Sensing and Gis Applications in Environmental Engineering

(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

Q1) a) Define Electromagnetic Radiation and its interactions with atmosphere. **[5]**

b) Explain in brief applications Remote Sensing technique. **[5]**

Q2) Write short note on “Various satellites in orbit and their sensors” in detail. **[10]**

Q3) a) Write down the use of Aerial Photographs in industry. **[5]**

b) Explain Active and Passive Remote Sensing system. **[5]**

Q4) Differentiate between analog and digital system of remote sensing. **[10]**

Q5) Write short notes on **[10]**

a) Image classification.

b) Indian remote sensing satellites.

Q6) Explain the following in brief. **[10]**

a) Spectral response of natural earth surface features.

b) Interpretation of radar imagery.

P.T.O.

Q7) Explain concept of G.I.S. and state any four components of G.I.S. [10]

Q8) State any four data sources for G.I.S. [10]



Total No. of Questions : 8]

SEAT No. :

P4060

[Total No. of Pages : 2

[5155] - 310

M.E. (Chemical) (Semester - III)

ENVIRONMENTAL ENGINEERING

Industrial Pollution Prevention & Cleaner Production

(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Attempt any 5 questions.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Correlate environment, industrialization and sustainable development. [5]

b) State the different Barriers to sustainability? [5]

Q2) a) What are new environmental policies and regulations to encourage pollution prevention. [5]

b) What do you mean by cleaner technology and cleaner production concept. [5]

Q3) a) Discuss historical evolution of pollution prevention and control. [5]

b) Explain the role of industries, Government, institutions in pollution prevention and control. [5]

Q4) a) Write the source for reduction techniques in pollution control in chemical industries. [5]

b) How is Internet information for pollution prevention & cleaner production useful. [5]

P.T.O.

Q5) Justify that the process and equipment optimization is important aspect in pollution prevention & cleaner production. **[10]**

Q6) Discuss the technical and environmental feasibility analysis as well as total cost analysis of pollution prevention & cleaner production program. **[10]**

Q7) a) Discuss the International Environmental Standards. **[5]**

b) Write a note on Environmental Audit. **[5]**

Q8) Write short notes on :

a) Elements of Life Cycle Assessment (LCA). **[5]**

b) Life cycle costing. **[5]**



Total No. of Questions : 8]

SEAT No. :

P4061

[Total No. of Pages : 3

[5155] - 311

M.E. (Instrumentation & Control (Biomedical) (Semester - I)
MATHEMATICAL METHODS IN INSTRUMENTATION
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Assume Suitable data if necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*

- Q1)** a) Define linear dependent and independent vectors. [2]
b) If $\bar{u} = (-1,1,2)$, $\bar{v} = (2,-1,2)$ then find Euclidean inner product [4]
 $\langle 2\bar{u} - 3\bar{v}, 3\bar{u} + \bar{v} \rangle$
c) Determine basis and dimension of vectors $(3,8,-3,-5)$, $(1,-2,5,-3)$,
 $(2,3,1,-4)$ in a vector space $V = \mathbb{R}^4$. [4]
- Q2)** a) Let $\bar{v}_1 = (1,0,1)$ $\bar{v}_2 = (-1,1,0)$ be an orthonormal set of vectors in \mathbb{R}^3 , if
 $\bar{u} = (1,2,3)$ find orthogonal projection \bar{u} on W and orthogonal
component of \bar{u} to W . [5]
b) Obtain orthonormal vectors from the following vectors (Use Gram-
Schmidt method) $\bar{u}_1 = (1,1,1)$ $\bar{u}_2 = (-1,1,0)$, $\bar{u}_3 = (1,2,1)$. [5]
- Q3)** a) Find cube root of 13 by Newton Raphson method. [3]
b) Solve by Gauss-Seidal iteration method [5]
 $10x_1 + 2x_2 + x_3 = 9,$
 $2x_1 + 20x_2 - 2x_3 = -44,$
 $-2x_1 + 3x_2 + 10x_3 = 32.$
c) Explain Role of Numerical method in Mathematics. [2]

P.T.O.

- Q4)** a) Determine the value of y when $x = 0.1$, by Euler modified method given that $\frac{dy}{dx} = x^2 + y$, $y(0) = 1$ and $h = 0.05$. [5]
- b) If the probability that an individual suffers a bad reaction from certain injection is 0.001, determine the probability that out of 2000 individual
- exactly 3 [5]
 - more than two individual
 - None, will suffer a bad reaction.
- Q5)** a) A continuous random variable X has a probability density function given by $f(x) = 2e^{-x}$, $x > 0$. and $f(x) = 0$, $x \leq 0$. [5]
Find
- $E(X)$,
 - $E(X^2)$
- b) Explain the terms [5]
- Moments
 - Moments Generating Function.
- Q6)** a) A joint PDF of two continuous random variable X and Y is [6]
 $f(x,y) = cxy$, $0 < x < 4$, $1 < y < 5$. and $f(x,y) = 0$, otherwise.
- Find the value of constant C
 - Find $p[1 < x < 2, 2 < y < 3]$
 - Find $p[x \geq 3, y \leq 2]$.
- b) Explain the terms [4]
- Probability definition.
 - Axioms of Probability.
- Q7)** a) Find singular value decomposition of the matrix $A = \begin{bmatrix} 2 & -1 \\ 2 & 2 \end{bmatrix}$. [5]
- b) Let R^4 have a Euclidean inner product, Find the cosine of angle between the vectors $\bar{u} = (-1, 2, 3, 4)$ and $\bar{v} = (4, 1, 2, 1)$. [5]

- Q8)** a) The first four central moments of a distribution are 0, 2.5 , 0.7 and 18.75. Comment on the skewness and kurtosis of the distribution. [5]
- b) Assume that the probability of an individual coal miner being killed in a mine accident during a year is $\frac{1}{2400}$. Use appropriate statistical distribution to calculate probability that in a mine employing 200 miners ,there will be at least one fatal accident in a year. [5]



Total No. of Questions : 8]

SEAT No. :

P4062

[Total No. of Pages : 2

[5155] - 312

M.E. (Instrumentation & Control) (Semester - I)

BIOMEDICAL INSTRUMENTATION

Bio-Signal Processing

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any 5 questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) Explain the properties of Discrete Fourier Transform (DFT) in detail. [10]

Q2) Explain the classification of systems with examples. [10]

Q3) Define following types of signals with example: [10]

- a) Periodic signal.
- b) Energy signal.
- c) Power signal.
- d) Even and odd signal.

Q4) a) Determine the linear convolution of the following sequences: [6]

$$x_1(n) = \{5, 3, 2, 6\}$$

$$x_2(n) = \{7, 8, 9, 10\}$$

- b) State the following properties of convolution: [4]
- i) Associative.
 - ii) Distributive.

P.T.O.

Q5) An IIR digital low-pass Butterworth filter is required to meet the following specifications: **[10]**

Passband ripple : $\leq 1\text{dB}$

Passband edge : 2 kHz

Stopband attenuation : $\leq 36\text{dB}$

Stopband edge : 3 kHz

Sample rate : 8 kHz Use the bilinear transformation.

Q6) Explain how noise interference in biomedical signal is eliminated using adaptive filtering. Explain the LMS algorithm in adaptive filtering. **[10]**

Q7) Determine the 8-point DFT of sequence $x(n) = \{1, 2, 3, 4\}$ using decimation-in-frequency radix-2 FFT algorithm. **[10]**

Q8) Design an FIR low-pass filter using Blackman window having desired frequency response. **[10]**

$$H_d(\omega) = \begin{cases} e^{-j5\omega}, & \text{for } |\omega| \leq \frac{\pi}{5} \\ 0, & \text{for } \frac{\pi}{5} < |\omega| \leq \pi \end{cases}$$



Total No. of Questions : 7]

SEAT No. :

P4063

[Total No. of Pages : 2

[5155] - 313

M.E. (Biomedical Instrumentation & Control) (Semester - I)

ANALYTICAL INSTRUMENTATION

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.*
- 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 table is allowed.*
- 5) Assume suitable data, if necessary.*

Q1) a) Give Detail Classification of Instrumental Method of Chemical Analysis. **[5]**

b) List Radiometric and Photometric units of chemical analysis. **[5]**

Q2) a) What is spectrophotometer? Explain UV-visible Spectrophotometer with neat sketch. **[5]**

b) List Various Types of nebulizer, Explain Babington types nebulizer with sketch. **[5]**

Q3) a) Explain Inductively coupled plasma(ICP) with neat sketch. **[5]**

b) Explain direct coupled plasma(DCP) with neat sketch. **[5]**

Q4) a) Explain with neat sketch Single beam fluorimeter. **[5]**

b) Explain with neat sketch phosphorimeter. **[5]**

P.T.O.

- Q5)** a) List and explain various factor affecting to separation in Gas Chromatography. [5]
b) Explain any one type of detector used in HPLC with neat sketch. [5]
- Q6)** a) Explain Proportional counter with neat sketch. [5]
b) What is ESCA? Explain auger emission spectroscopy. [5]
- Q7)** a) What is NMR? Explain the term Chemical Shift with neat sketch. [5]
b) Explain the experimental set up of Potentiometry with neat sketch. [5]



Total No. of Questions : 7]

SEAT No. :

P4064

[Total No. of Pages : 2

[5155] - 314

M.E. (Process Instrumentation & Control) (Semester - I)

RESEARCH METHODOLOGY

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam table is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) What are the techniques involved in defining research problem. [5]

b) Distinguish between research method and methodology. [5]

Q2) a) Enumerate the different method of collecting the data giving one example of each. [5]

b) Explain primary and secondary data collection methods. [5]

Q3) a) Distinguish between point estimate and interval estimate. [5]

b) Use following data to workout linear regression analysis. [5]

Sr.No.	Price	Sales
1	120	116
2	140	97
3	160	75
4	180	89
5	200	85

Find linear regression equation, Coefficient of correlation.

P.T.O.

- Q4)** a) Write a short notes on asymptotic analysis. [5]
b) Write a short notes on non linear analysis of system. [5]
- Q5)** a) What do you mean by the power of hypothesis test? How it can be measured? [5]
b) Explain different plots to shows the performance curves in research study. [5]
- Q6)** a) What is an abstract and what is its value in proposal. [5]
b) List and explain the characteristics of good research proposal. [5]
- Q7)** a) Write a short notes on documentation in the context of research proposal. [5]
b) Explain different steps in writing research report. [5]



Total No. of Questions : 5]

SEAT No. :

P4065

[Total No. of Pages : 2

[5155] - 315

M.E. (Instru. & Control) (Biomedical) (Semester - II)

TRANSDUCER DESIGN

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

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 electronic pocket calculator.*
- 5) *Assume suitable data, if necessary.*

Q1) Attempt any two of the following:

- a) Explain general selection criteria for selection of any sensor or transducer. [5]
- b) Explain importance of sensors and transducers in biomedical measurements. [5]
- c) Give any two techniques used for detection of radioactive radiations. [5]

Q2) Attempt any two of the following:

- a) Explain design of capacitive sensor and its signal conditioning circuit for measurement of level. [5]
- b) List and explain different circuits required for design of LVDT. [5]
- c) Explain various resistive sensors for temperature measurement. [5]

Q3) Attempt any two of the following:

- a) Explain design of torque transducer by using strain gauge. [5]
- b) List different types of level transducers and discuss any one in detail. [5]
- c) Explain different chemical sensors with their applications. [5]

P.T.O.

Q4) Attempt any two of the following:

- a) Explain working of electromagnetic flowmeter with its advantages. [5]
- b) List different biosensors with their biomedical applications. [5]
- c) What is MEMS? Explain advantages of MEMS in detail. [5]

Q5) Attempt any two of the following:

- a) Discuss design techniques for nano sensors. [5]
- b) List different gas sensors and explain any two in detail. [5]
- c) Explain LASER application in printing operations. [5]



Total No. of Questions : 8]

SEAT No. :

P4066

[Total No. of Pages : 2

[5155] - 316

M.E. (Instrumentation and Control) (Biomedical Instru.)

DIGITAL IMAGE PROCESSING

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any 5 questions.*
- 2) *Assume suitable data if necessary.*
- 3) *Use of calculators, log tables, charts is allowed.*
- 4) *Figures to the right indicate full marks.*

Q1) a) Describe basic steps in digital image processing system. [5]

b) Explain image resolutions with suitable examples. [5]

Q2) a) Define and explain Adjacency with suitable examples. [5]

b) Explain path and distance calculations with examples. [5]

Q3) a) Define DFT. Explain its properties. [5]

b) Define Gabour transform and explain its properties. [5]

Q4) a) Explain image enhancement in frequency domain. [5]

b) Enhance following image using mean filter. [5]

1 2 3

4 5 6

7 8 9

Q5) a) Explain image degradation model. [2]

b) Explain image restoration using spatial filters. [4]

c) Explain image restoration using constrained least square filtering. [4]

P.T.O.

Q6) a) Explain brightness adaption and discrimination with suitable example. [5]

b) Explain homomorphic filtering. [5]

Q7) a) Enhance the following image using high boost filter. [5]

10 20 30

20 10 20

30 20 10

b) Explain discriptors for segmentation. [5]

Q8) a) State characteristics of image digitizer. [2]

b) Detect the edges in the following image using Sobel operator. [5]

10 20 30

20 10 20

30 20 10

c) Explain patterns with suitable example. [3]



Total No. of Questions : 8]

SEAT No. :

P4067

[Total No. of Pages : 2

[5155] - 317

M.E. (Instrumentation & Control) (Biomedical)
COMMUNICATION PROTOCOLS FOR INSTRUMENTATION
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *You are advised to attempt not more than 5 questions.*
- 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.*

- Q1)** a) Compare Foundation Fieldbus H1, Profibus PA with respect to Communication Speed and Maximum number of stations. [4]
b) How does redundancy handle failure of physical medium in Fieldbus? [4]
c) What is the role of 'Preamble' in a message frame during communication? [2]
- Q2)** a) List and explain any four teams involved along with their responsibilities in implementing Fieldbuses on a sizable automation project. [4]
b) Explain the Enterprise network with respect to its characteristics and requirements. [4]
c) Explain Manchester encoding used in synchronous communication. [2]
- Q3)** a) With a neat diagram, explain the mapping of variants of Profibus on the OSI layer. [4]
b) What are the tasks of FMS sublayer in Fieldbus? [4]
c) Explain the Query Response structure in MODBUS. [2]

P.T.O.

- Q4)** a) Explain the requirements of the sensor level networks and list any two protocols used in this level. [4]
 b) List and explain the information contained in Segment drawings. [4]
 c) Explain the following network blocks: [2]
 i) Gateways.
 ii) Hub.
- Q5)** a) Explain the redundancy and failure considerations in Fieldbus. [5]
 b) List the three Bus arbitration techniques used in networks. [3]
 c) Explain the role of LAS in Fieldbus system. [2]
- Q6)** a) Explain the different types of VCRs used in Fieldbus. [5]
 b) Elaborate the use of Function block library in Foundation Fieldbus Network. [3]
 c) List any two physical network design rules applying to Spurs in Profibus PA. [2]
- Q7)** a) With respect to communication basics, explain the following: [5]
 i) Asynchronous communication.
 ii) Manchester encoding.
 iii) Parity.
 iv) Cyclic Redundancy Codes.
 v) Analog Signaling.
 b) With neat diagrams, explain the hybrid method used for regulating media access in Profibus DP systems. [5]
- Q8)** Write short notes:
 a) Commissioning of HART devices. [5]
 b) Zigbee Wireless Communication. [5]



Total No. of Questions : 8]

SEAT No. :

P4068

[Total No. of Pages : 2

[5155] - 318

M.E. (Biomedical Instrumentation) (Semester - III)

MEDICAL IMAGING TECHNIQUES

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any FIVE questions.*
- 2) *Use of scientific calculator is allowed.*
- 3) *Draw diagrams wherever necessary.*
- 4) *Figures to the right indicate full marks.*

- Q1)** a) Explain the role of energy in medical imaging. [3]
b) Draw and explain block diagram showing the components associated with medical imaging. [5]
c) What is contrast resolution in CT? [2]
- Q2)** a) Explain principle of generation of Characteristic Xrays. [4]
b) Define Contrast. Explain Gray scale of contrast. [4]
c) What is the role of contrast agent used in Angiography? [2]
- Q3)** a) Draw block diagram of CT scanner & explain it in detail. [5]
b) How Mammagraphy Xray unit is different than a routine Xray m/c & why is it so? [5]
- Q4)** a) Explain how Echoencephalography uses A mode of ultrasound. [5]
b) Describe the effect of mA control on X ray emission spectrum. [3]
c) List various factors affecting the interaction between the ultrasound waves and biological tissues. [2]

P.T.O.

- Q5)** a) How to check the linearity of CT scanner? [2]
b) Explain mechanical matching in ultrasound transducers. [3]
c) Write short note on Color Doppler flow measurement. [5]
- Q6)** a) Explain the working of Xray image intensifier system with the help of a block diagram. [4]
b) What is the significance of relaxation process in NMR imaging. Distinguish between T₁ and T₂ relaxation times. [4]
c) Enlist the advantages of thermography over other imaging techniques. [2]
- Q7)** a) Draw the block diagram of pulse height analyser and explain it's working. [5]
b) Describe Imaging pulse sequence in MRI. [5]
- Q8)** a) Write a short note on 'Xero radiography'. [5]
b) Describe stepwise procedure for Angiography. [3]
c) What is used as a filter for X ray? How the filtering characteristics are changed. [2]



Total No. of Questions : 8]

SEAT No. :

P4069

[Total No. of Pages : 2

[5155] - 319

M.E. (Instrumentation and Control) (Biomedical Instrumentation)

ADVANCED DIGITAL SIGNAL PROCESSING

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Solve any five questions.
- 2) Figures to the right indicate full marks.

- Q1)** a) Define Short Time Fourier Transform and state its properties. [4]
b) Define Time Frequency Distribution. Explain with suitable application. [4]
c) Define Wavelet Transform. [2]
- Q2)** a) Obtain the DOWN sampling of the causal signal $x(n) = n/2$, by the factor of 4. [5]
b) Explain Interpolation with polyphase filters. [5]
- Q3)** a) Explain SSS and WSS processes. [4]
b) Discuss the models of stochastic processes. [3]
c) Explain spectral factorization. [3]
- Q4)** a) Explain power spectral estimation with suitable example. [2]
b) Explain Bartlett method of PSD estimation. [4]
c) Explain ARMA models for PSD estimation. [4]

P.T.O.

- Q5)** a) State applications of adaptive filtering. Explain any one. [5]
b) Explain RLS algorithm for adaptive filter design. [5]
- Q6)** a) Explain International broadcasting standards. [5]
b) Explain JPEG2000 standard of image compression. [5]
- Q7)** a) Explain homomorphic signal processing for convolution. [5]
b) Explain the need of data compression with suitable example. [5]
- Q8)** a) Explain adaptive filter. [5]
b) Explain Periodogram method for power spectrum estimation. [5]



Total No. of Questions : 5]

SEAT No. :

P4070

[Total No. of Pages : 2

[5155] - 320

M.E. (Instru. & Control) (Process Instru.)

TRANSDUCER DESIGN

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

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 electronic pocket calculator.*
- 5) *Assume suitable data, if necessary.*

Q1) Attempt any two of the following:

- a) Give detail classification of pressure sensors and transducers with their measurement ranges. [5]
- b) Explain strain gauge load cell and its piezoelectric sensor with charge amplifier. [5]
- c) Design a temperature indicator by using thermocouple with cold junction compensation. [5]

Q2) Attempt any two of the following:

- a) Design capacitive type level indicator used for measurement of level. [5]
- b) Discuss inductive proximity sensor and its signal conditioning circuits. [5]
- c) Explain electromagnetic flowmeter and its different types of excitation. [5]

Q3) Attempt any two of the following:

- a) Explain different circuits required for design weight indicator using load cell. [5]
- b) With neat sketch explain dynamometer for measurement of torque. [5]
- c) Give different types Chemical sensors with their applications. [5]

P.T.O.

Q4) Attempt any two of the following:

- a) Explain two different modes of ultrasonic flowmeter. [5]
- b) Write note on gas sensors and its applications. [5]
- c) Explain manufacturing process of MEMS with neat sketch. [5]

Q5) Attempt any two of the following:

- a) Write short note on biosensors and its applications. [5]
- b) Explain any two LASER applications in detail. [5]
- c) Write short note on nano sensors and its applications. [5]



Total No. of Questions : 7]

SEAT No. :

P4071

[Total No. of Pages : 2

[5155] - 321

M.E. (Instrumentation & Control) (Process Instrumentation)

INDUSTRIAL AUTOMATION

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) Develop programmable ladder diagram for flashing of lamp for every 20 seconds. [5]
b) Enlist specifications of any typical PLC. [5]
- Q2)** a) Explain working principle of HART protocol in detail. [5]
b) Explain in brief Role of Automation in Industries. [5]
- Q3)** a) Explain consequences of risk. [5]
b) Explain in brief calibration of Profibus. State advantages of Profibus. [5]
- Q4)** a) Draw and explain a famous automation hierarchy for an industrial application. [5]
b) Explain the function of each level of automation hierarchy. [5]
- Q5)** a) Explain with an example 'Sequential Function Chart'. [5]
b) Explain in brief commissioning of HART. [5]

P.T.O.

- Q6)** a) Explain with example Process Hazard Analysis. [5]
- b) Explain in brief application of safety system. [5]
- Q7)** a) Discuss in brief with suitable block diagram any two major components of the DCS. [5]
- b) Describe the data flow and number conversions involved in PLC analog operation. [5]



Total No. of Questions : 7]

SEAT No. :

P4072

[Total No. of Pages : 2

[5155] - 322

M.E. (Instrumentation & Control) (Process Instrumentation)

ADVANCED PROCESS CONTROL

(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) Explain in detail different types of decoupling. [5]
b) Derive relation for setpoint tracking and disturbance rejection for Feedforward control. [5]
- Q2)** a) Explain in detail dynamic behavior of second order system. [5]
b) Explain with example control charts. [5]
- Q3)** a) Explain design procedure of MRAS using Lyapunov stability rule. [5]
b) Explain with suitable example improvement in performance using cascade control system. [5]
- Q4)** a) Describe the process reaction curve method for identifying dynamic models. [5]
b) Draw control Loop schematics to indicate the two ways in which Ratio controller can be configured. [5]
- Q5)** a) Explain in brief procedure for calculating Relative Gain Array for 2 x 2 systems. [5]
b) Discuss in brief Interaction. [5]

P.T.O.

- Q6)** a) Explain with suitable example MPC. [5]
b) Write a brief note on IMC based PID controller. [5]
- Q7)** a) What do you understand by statistical process control. [5]
b) With the help of neat sketch explain inferential control. [5]



Total No. of Questions : 5]

SEAT No. :

P4073

[Total No. of Pages : 2

[5155] - 323

M.E. (Instru. & Control) (Process Instru.) (Semester - II)

EMBEDDED SYSTEM DESIGN

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

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 electronic pocket calculator.*
- 5) *Assume suitable data, if necessary.*

Q1) Attempt any two of the following:

- a) Explain different clock sources of AT8535 AVR microcontroller. [5]
- b) Explain with neat block schematic UART transmitter of AT Mega8535 AVR μ C. [5]
- c) Explain 8-bit timer/counter0 pre-scalar of ATMega8535 AVR μ C. [5]

Q2) Attempt any two of the following:

- a) Explain ARM Bus Technology. [5]
- b) Explain memory organization of ARM processor. [5]
- c) What is ARM - Thumb interworking? Explain with example. [5]

Q3) Attempt any two of the following:

- a) What is difference between USB and RS-232? [5]
- b) What are the limitations of I²C communication? [5]
- c) Explain with neat schematic PC Parallel Port. [5]

P.T.O.

Q4) Attempt any two of the following:

- a) Explain in detail the standard CAN architecture. [5]
- b) Explain different states of USB data communication. [5]
- c) Describe the four primary benefits of CAN protocol provides. [5]

Q5) Attempt any two of the following:

- a) Explain different FPGA design tools. [5]
- b) Explain traditional FPGA design flow. [5]
- c) Why SRAM based FPGAs are popular when compared to other types? [5]



Total No. of Questions : 5]

SEAT No. :

P4074

[Total No. of Pages : 2

[5155] - 324

M.E. (Instru. & Control) (Process Instru.) (Semester - II)

ADVANCED CONTROL SYSTEM

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of electronic pocket calculator.
- 5) Assume suitable data, if necessary.

Q1) Attempt any two of the following:

- a) Differentiate linear and nonlinear systems in detail. [5]
- b) Explain jump response characteristics of nonlinear system with example. [5]
- c) Explain concept of phase plane in control system analysis. [5]

Q2) Attempt any two of the following:

- a) Define describing function. Find describing function for saturation element. [5]
- b) Explain concept of describing function analysis for non-linear system with necessary diagrams. [5]
- c) Discuss explain limit cycle and its types with necessary diagrams. [5]

Q3) Attempt any two of the following:

- a) Explain stability in the sense of Lyapunov with graphical representation. [5]
- b) Show that following quadratic form is positive definite. [5]

$$V(x) = 8x_1^2 + x_2^2 + 4x_3^2 + 2x_1x_2 - 4x_1x_3 - 2x_2x_3 .$$

- c) Determine the stability of a non-linear system governed by equation [5]

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

$$\dot{x}_2 = -x_2 - x_1$$

P.T.O.

Q4) Attempt any two of the following:

- a) Explain zero dynamics in feedback linearization with example. [5]
- b) Explain input-output linearization in detail with example. [5]
- c) Explain input-state linearization in detail with example. [5]

Q5) Attempt any two of the following:

- a) Design a sliding mode control for any system. Also draw its outputs. [5]
- b) With reference to sliding mode control theory explain control, surface and reachability in detail with necessary diagrams. [5]
- c) What is chattering in SMC? Also explain techniques used for a avoidance of chattering. [5]



Total No. of Questions : 5]

SEAT No. :

P4075

[Total No. of Pages : 2

[5155] - 325

M.E. (Instrumentation and Control) (Process Instru.)

ADVANCED SIGNAL PROCESSINGS

(2013 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator.*
- 5) *Assume suitable data, if necessary.*

Q1) Attempt any two questions:

- a) Compute four point DFT of given sequence $x[n] = \{1, 1, 1, 1\}$. [5]
- b) Explain different features of STFT over DFT. [5]
- c) Explain any one application of adaptive filtering. [5]

Q2) Attempt any two questions:

- a) List and explain various properties of Complex Cepstrum. [5]
- b) Explain homomorphic signal processing and its application for speech processing. [5]
- c) Explain noble identities in sampling rate conversion. [5]

Q3) Attempt any two questions:

- a) Draw and explain structure of polyphase filter with polyphase decomposition. [5]
- b) What do you mean integer band positioning explain even and odd integer band positioning. [5]
- c) Explain following properties of continuous wavelet transform: [5]
 - i) Translation.
 - ii) Wavelet scaling.
 - iii) Wavelet shifting.
 - iv) Linear combination.

P.T.O.

Q4) Attempt any two questions:

- a) Explain errors created in QMF filter bank. **[5]**
- b) Write short note on simple alias free QMF systems. **[5]**
- c) Explain power symmetric QMF filter banks. **[5]**

Q5) Attempt any one question:

- a) Write short on innovations representation of a stationary random process. **[10]**
- b) Explain any two non parametric methods for power spectrum estimation. **[10]**



Total No. of Questions : 7]

SEAT No. :

P4076

[Total No. of Pages : 2

[5155] - 326

M.E. (Process Instrumentation & Control) (Semester - I)

BUILDING AUTOMATION

(2013 Pattern)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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 table is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Draw the basic block diagram of building life safety system, explain each block in details. **[5]**

b) Explain classification of fire detection systems. What are fire suppression systems. **[5]**

Q2) a) Explain how template are generated in biometrics system with neat sketch. **[5]**

b) Explain network Access Control System with neat Sketch. **[5]**

Q3) a) Explain fire tube type of boiler with neat sketch. **[5]**

b) What is Human comfort explain human comfort zone, List different factor affecting to human comfort zone. **[5]**

Q4) a) Explain any one type of evaporator used in vapour compression cycle with neat sketch. **[5]**

b) Write a short notes on Control Reset. **[5]**

P.T.O.

- Q5)** a) Explain DDC Architecture with neat sketch. [5]
b) Write a short notes on BACnet. [5]
- Q6)** a) Explain any one application of BMS Verticals. [5]
b) What is green building, explain goals of green building. [5]
- Q7)** a) Explain Project Management, what are the characteristics of project. [5]
b) What is the difference between project life cycle & project management life cycle. [5]



Total No. of Questions : 8]

SEAT No. :

P4077

[Total No. of Pages : 4

[5155] - 327

M.E. (Polymer)

MATHEMATICAL AND STATISTICAL METHODS

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.
- 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.

Q1) a) Use Gauss - Seidel method to solve the system of equations: [5]

$$2x_1 + x_2 + 6x_3 = 9$$

$$8x_1 + 3x_2 + 2x_3 = 13 \cdot$$

$$x_1 + 5x_2 + x_3 = 7$$

b) Use power method to determine the largest eigen values and the corresponding eigen vector of the following Matrix A. [5]

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

Choose initial vector $\bar{X} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$.

P.T.O.

Q2) a) Find z- transform of the following (any two): **[6]**

i) $\left(\frac{1}{5}\right)^k, k \geq 0.$

ii) $\frac{3^k}{k}, k \geq 1.$

iii) $e^{-2k} \sin 3k, k \geq 0.$

b) Find inverse z - transform of the following (any one): **[4]**

i) $\frac{z(3z+2)}{(z-2)(z-1)}, 1 < |z| < 2.$

ii) $\frac{1}{(z-2)(z-3)}$ using inversion integral method.

Q3) a) Solve the difference equation: **[5]**

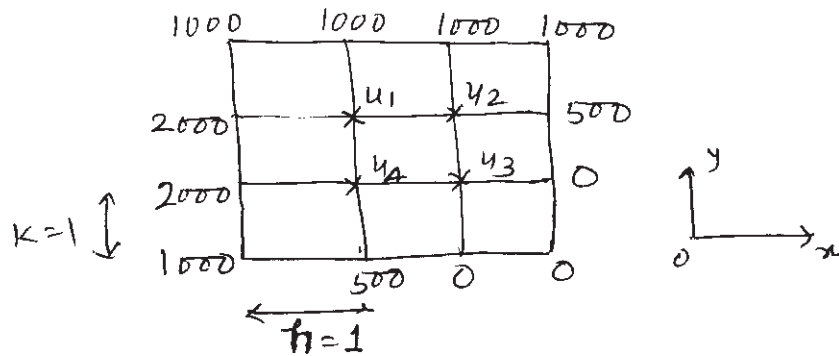
$$f(k+1) + \frac{1}{2}f(k) = \left(\frac{1}{2}\right)^k, k \geq 0, f(0) = 0.$$

b) Evaluate $\int_{-1}^1 (1-x^2)^{3/2} \cos x \, dx$ using Gauss-Quadrature two point formula. **[5]**

Q4) a) Use Runge - Kutta fourth order method to find y at $x = 0.4$. **[5]**

Given $\frac{dy}{dx} = \frac{1}{(x+y)}, y(0) = 1, h = 0.2.$

- b) Given the values of $u(x, y)$ on the boundary of the square given below. Evaluate the function $u(x, y)$ at nodal points 1, 2, 3, and 4 where $u(x, y)$ satisfies the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0, h = k = 1$. [5]



- Q5) a) Solve the boundary value problem using finite difference technique: [5]

$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} = 1, y(1) = 0, y(1.4) = 0.0566, h = 0.1.$$

- b) For one dimensional heat flow problem, explain explicit finite difference method for solution. Discuss the stability of the method. [5]

- Q6) a) Find the extremal of $\int_{x_1}^{x_2} (y'^2 + 12xy) dx$. [5]

- b) Use Galerkin's method to solve $y'' - y + x = 0$ [5]

$$\text{Given } 0 \leq x \leq 1, y(0) = y(1) = 0.$$

- Q7) a) Reduce the following matrix into tridiagonal form using Householder's method. [5]

$$A = \begin{bmatrix} 1 & 4 & 3 \\ 4 & 1 & 2 \\ 3 & 2 & 1 \end{bmatrix}.$$

- b) Solve the following system of equations using LU decomposition method: [5]

$$x_1 + 2x_2 + 3x_3 = 14$$

$$2x_1 + 3x_2 + 4x_3 = 20$$

$$3x_1 + 4x_2 + x_3 = 14$$

- Q8) a) The table below gives number of books issued from a certain library on various days of a week.

Days	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Number of books issued	120	130	110	115	135	110

Assuming everyday number of books to be issued 120, test at 5% l.o.s. whether issuing the book is day dependent.

Given $\chi_{5;0.05}^2 = 11.07$. [5]

- b) The mean life of a sample of 100 bulbs produced by company is 1570 hrs. and standard deviation of 120 hrs. The company claims that average life of bulbs produced by it is 1600 hrs. Is the claim acceptable? Given at 5% los, $t = 1.96$. [5]



Total No. of Questions : 8]

SEAT No. :

P4078

[Total No. of Pages : 2

[5155] - 328

M.E. (Polymer Engineering) (Semester - I)

PRINCIPLES OF MANAGEMENT

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five 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) What is mean by management? Explain in brief functions of management. **[4]**

b) What are the different forms of organization? Explain line organization in brief. **[3]**

c) Discuss the governing factors for plant location. **[3]**

Q2) a) What is personnel management? Discuss the need of manpower planning. **[4]**

b) Write a note on sources of finance and financing institutes. **[4]**

c) State the difference between sales and marketing. **[2]**

Q3) a) Suppose total fixed cost is Rs. 10,000, product prize Rs. 5 and average variable cost is Rs. 2. What is the output necessary to earn Rs. 5,000 total profit? What is the “average contribution margin”? **[4]**

b) What is Inventory control? Define need for inventory control. **[4]**

c) State the objectives of technological forecasting. **[2]**

P.T.O.

- Q4)** a) Explain the importance of research and development in polymer industry. [4]
b) Write a note on product life cycle. [4]
c) Explain the importance of advertising in marketing. [2]
- Q5)** a) What is combination layout? [4]
b) Explain the process of employee training with its various methods and benefits. [4]
c) Give brief idea about units of command and direction. [2]
- Q6)** a) What is market segmentation? Explain targeting and positioning. [4]
b) Explain the flow process chart. [4]
c) What is authority and responsibility? [2]
- Q7)** a) A fixed asset having a useful life of 3 years is purchased on 1 January 2013. Cost of the asset is \$2,000 whereas its residual value is expected to be \$500. Calculate depreciation expense for the years ending 30 June 2013 and 30 June 2014. [5]
b) Explain the role of personnel manager and define the recruitment process. [5]
- Q8)** a) Write notes on (Any Two): [5]
i) Two handed process chart.
ii) Industrial fatigue.
iii) Technology strategy.
b) Explain “Decision-making for cost effectiveness”. [5]



Total No. of Questions : 8]

SEAT No. :

P4079

[Total No. of Pages : 2

[5155] - 329

M.E. (Polymer Engineering) (Semester - I)

ADVANCED POLYMER TECHNOLOGY

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

Q1) a) Write a note on chain microstructure and its characterization by spectroscopy. [5]

b) Discuss thermodynamics of polymer dissolution. [5]

Q2) a) Explain oxidative polymerization in detail. [5]

b) Write a note on electro-conductive polymers. [5]

Q3) Discuss ROMP and NMP. Compare. [10]

Q4) a) Write a note on polymer electrolytes. [5]

b) Write a note on silane containing polymers. [5]

Q5) a) Explain the role of H-bonding and ionic charge to build structures in self-assembly polymers. [5]

b) What are fluoro-polymers? Give their synthesis and characteristic properties. [5]

P.T.O.

- Q6)** a) Explain the concept of click polymerization. [5]
b) Write a note on photo-responsive polymers. [5]
- Q7)** a) Differentiate crystalline melting temperature and glass transition temperature. [5]
b) Explain dispersion polymerization. [5]
- Q8)** a) Write a note on functional polymers and their applications. [5]
b) Write a note on inorganic polymers. [5]



Total No. of Questions : 8]

SEAT No. :

P4080

[Total No. of Pages : 4

[5155] - 330

M.E. (Polymer Engineering) (Semester - I)

RESEARCH METHODOLOGY

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any 5 questions from the following.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*
- 5) *Use of calculator is allowed.*
- 6) *Students are permitted to use standard statistical tables having normal distribution area, F-test data, χ^2 test data etc.*

- Q1)** a) What are different types of research? Give examples for each. [3]
- b) Discuss the criteria for choice of topic of research. [4]
- c) Explain the importance of review of literature, different sources of literature. [3]
- Q2)** a) Explain in detail with diagram different steps in “Research Methodology”. [6]
- b) What is inductive method and deductive method in research. Explain with flow chart. [4]
- Q3)** a) How to collect data and represent it in different forms? Which is best suited for engineering research? [3]
- b) How do you estimate mean deviation? Sum of squares between samples and sum of squares within sample? [4]
- c) What is degree of freedom? There are values grouped in 6 columns and 4 rows. What are the different degrees of freedom? [3]

P.T.O.

Q4) a) Explain how to carry out linear regression analysis using computer program. What is the significance of R^2 value. [4]

b) Explain the term covariance. Give examples with diagram for variants which are strongly covariant, negative covariant and not covariant. [3]

c)

X	2	4	6	8	10
Y	4.5	9.2	13.5	17.9	23.0

Estimate the covariance between X and Y values given in the above table. What does the covariance value indicate? [3]

Q5) a) Define ANOVA and one way and two way methods. Where do you use two way ANOVA. [3]

b) Set up the ANOVA table for following example. Four grades of UV stabilizer was used in HDPE and accelerated test UV test was carried out with the hours before failure given in the table below. From ANOVA, find if there is any significant change in the different grades of stabilizer. Use the critical Factor table for 5%. [7]

UV stabilizer	Accelerated test hours				
1	1600	1610	1650	1680	1700
2	1580	1640	1640	1700	1750
3	1450	1550	1600	1620	1640
4	1510	1520	1530	1570	1600

Q6) a) Explain the different sections/formats in a project proposal. [4]

b) What are the agencies for submitting the project proposal? [3]

c) How do you estimate the budget for the proposed project? [3]

- Q7)** a) Write a note on different forms of reporting the research results. [4]
b) Explain the different steps involved in obtaining patent. [4]
c) Explain Impact Factor of a journal. [2]
- Q8)** a) Explain the term IPR. Which are different categories of IPR. [4]
b) Explain the difference in journal publications, conference paper and short communication. [4]
c) Explain the difference between Product patent and Process patent. [2]



*F*_{05,0.02}

		Degrees of Freedom for the Numerator (v ₁)																		
v ₂		1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
		1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	252.3
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.48	19.49	19.50
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.57	8.55	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63	5.63
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36	4.36
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67	3.67
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23	3.23
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93	2.93
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71	2.71
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54	2.54
11	4.48	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40	2.40
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30	2.30
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21	2.21
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13	2.13
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07	2.07
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01	2.01
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96	1.96
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92	1.92
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88	1.88
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84	1.84
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81	1.81
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78	1.78
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76	1.76
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73	1.73
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71	1.71
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69	1.69
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67	1.67
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65	1.65
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64	1.64
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62	1.62
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51	1.51
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39	1.39
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.49	1.43	1.35	1.25	1.25
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.10	1.10

Degrees of Freedom for the Denominator (v₂)

Total No. of Questions : 8]

SEAT No. :

P4081

[Total No. of Pages : 2

[5155] - 331

M.E. (Polymer Engineering) (Semester - II)

POLYMER PROCESSING AND TESTING

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any 5 questions from total 8 questions.*
- 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.*

- Q1)** a) Write a detailed note on grooved barrel. [4]
- b) What is devolatalization in extrusion? Explain the various methods of devolatalization. [3]
- c) List the types of products made by the process of calendaring. [3]
- Q2)** a) What is pressure flow in extruders? Analyze pressure flow. [5]
- b) Discuss the test method used for determination of vicat softening point. [3]
- c) Explain the significance of studying environmental stress cracking of plastics. [2]
- Q3)** a) Compare contiguous melting model and dispersed melting model related to melting in extruders. [5]
- b) Describe matched mold vacuum forming in details. [3]
- c) List the various products made by injection blow molding. [2]

P.T.O.

- Q4)** a) Write a detailed note on gas assisted injection molding. [4]
b) Discuss in details construction of molds used in transfer molding process. [3]
c) Explain the methods of roll heating used in calendaring process with neat figures. [3]
- Q5)** a) Explain with neat figure, the caterpillar haul-off system used for pipes. [4]
b) Explain the complete line used in extrusion of cast films. [3]
c) Discuss the test methods used for studying weathering properties of plastics. [3]
- Q6)** a) Discuss the process of injection stretch blow molding in details. [5]
b) Discuss parison programming in details. [3]
c) Explain the test method for determining barrier properties of films. [2]
- Q7)** a) Explain the process of compression molding in details with neat figure. [5]
b) Explain the process of rotational molding details with neat figures. [5]
- Q8)** a) Explain the process of plug assist thermoforming in details. [5]
b) Explain any two non-destructive testing methods in details. [5]



Total No. of Questions : 8]

SEAT No. :

P4082

[Total No. of Pages : 2

[5155] - 332

M.E. (Polymer Engineering) (Semester - II)
POLYMER PHYSICS AND CHARACTERIZATION
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any 5 questions from total 8 questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Explain in detail the classical theory of gelation. [4]
- b) With suitable examples discuss about conformation in polymers. [3]
- c) Elaborate the use of volume resistivity, surface resistivity in defining polymer properties. [3]
- Q2)** a) Explain in detail the concept of cohesive energy density and solubility parameter. Comment on the relevance of solubility parameter in understanding polymer solutions. [6]
- b) Explain working principle of DSC. With the help of schematic DSC scan, explain various transitions polymer undergoes during testing. [4]
- Q3)** a) Elaborate working principle of GPC. [2]
- b) Briefly explain the contact angle measurement technique used to measure surface tension. [3]
- c) Write a short note Thermo-mechanical Analysis (TMA) technique. [5]

P.T.O.

- Q4)** a) What do you understand by storage and loss modulus? Why these are important. [4]
b) Write a short note on Scanning Electron Microscopy (SEM). [6]
- Q5)** a) Discuss in brief various modes of polymer degradation. [4]
b) Explain the steps involved in evaluating polymer structure using FTIR technique. [6]
- Q6)** a) Briefly explain the working principle of NMR technique. [4]
b) Explain how molecular weight and its distribution are calculated from GPC data. [6]
- Q7)** a) Elaborate any one technique used to predict percent crystallinity of polymer. [5]
b) Explain how WLF equation can be used in predicting transition temperature. [5]
- Q8)** a) Write a short note on detectors used in GPC. [5]
b) Discuss in detail dynamic mechanical analysis (DMA) technique. [5]



Total No. of Questions : 8]

SEAT No. :

P4083

[Total No. of Pages : 2

[5155] - 333

M.E. (Polymer Engineering) (Semester - II)
POLYMER STRUCTURE AND PROPERTIES
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any 5 questions from total 8 questions.*
- 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.*

Q1) a) Discuss in detail the effect of carbon-carbon bond type present in main chain on mechanical and thermal properties of polymers. Give suitable examples. **[6]**

b) Nitrogen in the polymer backbone affects chain flexibility, thereby, affecting polymer properties. Do you agree? Justify with suitable examples. **[4]**

Q2) a) Comment on effect of carbon-oxygen ethereal and ester linkages in the main chain on polymer properties. **[6]**

b) Explain the concept of intermolecular forces. Explain how cross-linking affects polymer properties? **[4]**

Q3) a) What are spherulites? Elaborate various factors affecting the growth of spherulites. **[5]**

b) Explain how processing conditions affect structure development in case of melt processing of polymers. **[5]**

P.T.O.

- Q4)** a) Write a short note on Fringed Micelle Theory of polymer crystallization. [5]
- b) Polymer morphology affects the mechanical, thermal and optical properties of polymers. Justify with appropriate examples. [5]
- Q5)** a) What do you understand by monoaxially-and biaxially-oriented films? Explain how orientation affects these film properties. [6]
- b) Briefly explain the concept of hyperbranched polymers. Comment on their importance in polymer field. [4]
- Q6)** a) Discuss about sub-molecular level factors affecting different transitions in polymers. [6]
- b) What are various additives used in polymers? With respect to reinforcing filler, elaborate their effect on mechanical properties of polymers. [4]
- Q7)** a) Write short note on structural requirements in polymeric multiphase systems. [5]
- b) Explain how barrier properties are affected by polymer structure and by additives. [5]
- Q8)** a) What are dendrimers? Discuss in brief structure-property relations in dendrimers. [5]
- b) Briefly explain how nature, shape and size of clay particles affect polymer-clay nano-composite properties. [5]



Total No. of Questions : 8]

SEAT No. :

P4084

[Total No. of Pages : 2

[5155] - 334

M.E. (Polymer Engineering) (Semester - III)

POLYMER RHEOLOGY

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any 5 questions from total 8 questions.*
- 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.*

- Q1)** a) Discuss in details classification of fluids with examples. [5]
b) Explain the terms creep and creep compliance. [3]
c) Explain the term stress relaxation. [2]
- Q2)** a) Discuss the phenomena attributed to first normal stress difference. [4]
b) Explain the effect of long chain branching on rheology of polymer melts. [3]
c) Explain the effect of temperature on rheology of polymer melts. [3]
- Q3)** a) Discuss dynamic rheological experiments in details. [4]
b) Analyze creep and stress relaxation behavior of viscoelastic materials using Maxwell model. [4]
c) Discuss storage modulus and loss modulus. [2]

P.T.O.

- Q4)** a) Explain the terms bulk modulus, shear modulus, elastic modulus and Poisson's ratio in details. [4]
b) Write a detailed note on Rouse theory of relaxation. [3]
c) Discuss the WLF equation in details. [3]
- Q5)** a) Write a note on Ryan Johnson's criteria. [5]
b) Discuss power law model in details. [5]
- Q6)** a) Write in details about factors affecting flow activation energy. [5]
b) Discuss Ellis model in details. [5]
- Q7)** a) Derive an expression for velocity profile and shear rate at wall for a power law fluid through a circular cross section. [5]
b) Discuss in details construction of concentric cylinder rheometer. Derive an expression relating shear rate to geometry of the rheometer when the gap between the cylinders is very small. [5]
- Q8)** a) Discuss in details the effect of molecular weight and molecular weight distribution on rheology of polymer melts. [5]
b) Discuss in details Boltzman's Superposition Principle. [5]



Total No. of Questions : 8]

SEAT No. :

P4085

[Total No. of Pages : 2

[5155] - 335

M.E. (Polymer) (Semester - III)

TRANSPORT PHENOMENON IN POLYMERS

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

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

Q1) a) Explain the Cauchy's principle in detail. [5]

b) Explain the term vorticity tensors. [5]

Q2) a) Derive the expression for Hagen-Poiseulli's equation. [5]

b) Explain the Rheological behaviour of non-newtonian fluid with different models. [5]

Q3) a) Highlight the importance of dimensionless numbers in Transport Phenomenon of polymers. [5]

b) Explain the diffusion with heterogeneous chemical reaction. [5]

Q4) a) Which are the factors affecting permeability of polymers. [5]

b) Explain the design by using McCabe and Thiele method. [5]

P.T.O.

- Q5)** a) Write a note on controlled release through polymeric films. [5]
b) Explain heat transport by forced convection. [5]
- Q6)** a) Write a note on ion exchange resins. [5]
b) Explain application of differential balance to momentum transfer. [5]
- Q7)** a) Explain in short continuous counter multistage extraction. [5]
b) Explain vapour phase equilibria and enthalpy concentration diagram for distillation. [5]
- Q8)** a) A crude oil of viscosity 0.9 poise and relative density .9 is flowing through horizontal circular pipe of diameter 120 mm and length 12 m. Calculate difference of pressure at two ends if pipe if discharge is $0.0035 \text{ m}^3/\text{s}$ using Hagen-Poiseuille equation. [5]
b) Explain the importance of heat and mass transfer in polymer fluids. [5]



Total No. of Questions : 7]

SEAT No. :

P4086

[Total No. of Pages : 2

[5155] - 336

M.E. (Petroleum Engineering) (Semester - I)

NUMERICAL SIMULATION IN PETROLEUM ENGINEERING

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions from the following.*
- 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.*

Q1) a) Explain and note the Well and Surface Facility Modeling in Reservoir Simulation. [5]

b) Describe how process description and problem definition is carried out in modeling petroleum processes. [5]

Q2) Using Well Log data, some equations representing system parameters have been developed. Solve the following system of equations by the Gauss - Seidel method:

$$10x_1 + x_2 + x_3 = 12$$

$$2x_1 + 10x_2 + x_3 = 13$$

$$2x_1 + 2x_2 + 10x_3 = 14$$

Compute the answers correct to four decimal places up to four iterations only. [10]

Q3) With neat flow diagram, explain Geological Modeling with its various aspects. [10]

P.T.O.

Q4) Representation of empirical data has described following equation for the reservoir model. Find the real root of the equation by applying Newton-Raphson method at the end of fifth iteration: **[10]**

$$x^3 + 2x - 5 = 0.$$

Q5) For a undersaturated reservoir, all the produced gas R_p can be dissolved in the oil at reservoir conditions i.e. $R_p = R_s = R_{si}$

The recovery in such a reservoir is expressed as:

$$\frac{N_p}{N} = \frac{(B_o - B_{oi})}{B_o}$$

Write down the material balance equations and derive the recovery expression. **[10]**

Q6) Two phase separator at surface facility expresses its behavior by following differential equation:

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

Solve the system equation by using fourth order Rungee-Kutta method to find y at $x = 0.2$ and $x = 0.4$ using $h = 0.2$. **[10]**

Q7) Use Euler's method to solve the ordinary differential equation: **[10]**

$$\frac{dy}{dx} = -2x^3 + 12x^2 - 20x + 8.5$$

I.C. : $y(0) = 1$

Solve for $x = 0$ to $x = 2.5$ with a step size of 0.5.



Total No. of Questions : 8]

SEAT No. :

P4087

[Total No. of Pages : 2

[5155] - 337

M.E. (Semester - I)

PETROLEUM ENGINEERING

Geology in Reservoir Description

(2013 Pattern) (Credit System)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer Any Five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume additional data is required.*

- Q1)** a) Define the following [4]
Sorting of sediments, diagenesis, grain supported framework and sandy shale.
- b) What is normal and reverse sedimentation? Draw neat diagrams. [6]
- Q2)** a) Write in brief effects of post depositional changes on porosity with increasing depth. Draw sketches. [5]
- b) How does sorting of carbonate sediments compare with sorting of Siliciclastic sediments? [5]
- Q3)** a) What are the constituents of carbonate rocks? Draw sketches. [5]
- b) Draw a composite failure envelope showing variation in the growth of fractures with increasing confining pressure. Give brief description in support of diagram. [5]
- Q4)** a) Porosity permeability variation with increasing depth is given in following table. Plot a graph and comment on porosity permeability variation with increasing depth. [5]

P.T.O.

Depth	Porosity	Permeability	Depth	Porosity	Permeability
3000	18.30	300.00	3012	21.04	1241.87
3002	24.70	6435.00	3014	22.11	503.32
3004	12.20	453.00	3016	19.37	952.78
3006	14.70	2300.00	3018	25.04	1228.44
3008	12.40	515.00	3020	21.00	1716.00
3010	21.40	1085.00			

Table 1 for Q. 4 b

- b) Use above table to calculate hydraulic units from the data. How many flow units can be recognized here? [5]
- Q5)** a) Write with the help of a neat diagram volumetric description of a clastic reservoir. [5]
b) How is reservoir heterogeneity recognized on log and core scale? [5]
- Q6)** a) Define following terms [5]
Dual water system, Gas slippage, petroleum system, structure contour map, passion ratio.
b) Draw a schematic diagram showing steps in the creation of an integrated geological model. [5]
- Q7)** a) How is following recognized using logs [5]
Clean formation, cyclic sedimentation, presence of hydrocarbons.
b) What is Net to Gross thickness ratio? What are the parameters to decide this? Draw diagrams. [5]
- Q8)** a) Calculate the amount of oil present (OOIP) in a reservoir covering an area of 350 acres with an average thickness of 15ft. The average porosity is 21%, Formation Volume factor is 1.22, and water saturation is 28%. Calculate the changes in OOIP if variation of 10 percent is considered (lower and higher value). [5]
b) Differentiate between pixel based model and object based model. [5]



Total No. of Questions : 6]

SEAT No. :

P4088

[Total No. of Pages : 2

[5155] - 338

M.E.

PETROLEUM ENGINEERING

Advanced Drilling Engineering

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any Five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

Q1) a) Explain use of 'd' exponent to predict pore pressure while drilling in detail. [5]

b) Discuss corrosion design considerations in casing design in detail. [5]

Q2) a) What is GTO? Explain in detail. [5]

b) Discuss special casing design considerations in HPHT wells. [5]

Q3) a) Discuss importance of torque drag in planning of directional well. [5]

b) Discuss different types of horizontal wells in brief and explain double build up curve design in detail. [5]

Q4) a) Discuss functions of oil well cement, API classification of cement in detail. [5]

b) Write short note on Top plug and bottom plug. [5]

Q5) a) Discuss drill string design considerations in detail. [4]

b) Discuss tripping out and tripping in operation in detail. [6]

P.T.O.

- Q6)** a) Draw circulation system on rig and explain functions of mud cleaning equipment in detail. [6]
- b) What is hydraulics? Explain ECD effect on bottom hole pressure. [4]



Total No. of Questions : 8]

SEAT No. :

P4089

[Total No. of Pages : 2

[5155] - 339
M.E. (Semester - I)
PETROLEUM ENGINEERING
Research Methodology
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Attempt Any Five 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) What is a research problem? What considerations should a researcher keep in mind while formulating a research problem? [4]
- b) Explain the characteristics of good research. [3]
- c) Distinguish between basic research and applied research. [3]
- Q2)* a) Elaborate the steps in the process of research work. [3]
- b) Examine the different types of observations and their uses in Petroleum engineering research. Also, discuss the ethical issues involved in making use of the various Observational techniques. [4]
- c) Examine the merits and limitations of the interview method in collecting data for your research. [3]
- Q3)* a) What is hypothesis? Explain sources and characteristics of hypothesis.[3]
- b) What is a research problem? Define the necessity of identifying a research problem. [4]
- c) When you plan to initiate the research, what questions arise for the research directions? [3]

P.T.O.

- Q4)** a) What do you mean by a ‘case study’? Explain the steps involved in designing a case study to solve a research problem [4]
b) List components of research paper to be published in journal. [3]
c) What are the essential characteristics of a good questionnaire? [3]
- Q5)** a) Discuss the role of Internet in research by giving suitable example. [4]
b) Explain the underlying principle of ANOVA? [4]
c) What is the good structured paragraph mean? [2]
- Q6)** a) Write the steps involved in report writing and elaborate are importance in effective report writing. [4]
b) “Plagiarism of a content should be avoided” Justify the statement. [3]
c) Explain the characteristics of effective scientific presentation? [3]
- Q7)** a) Define and explain the term hypothesis’, and describe its usefulness in conducting research by suitable example. [5]
b) Discuss the different tools and techniques of data collection and analysis used in research. [5]
- Q8)** a) Write notes on: (Any Two) : [5]
i) BlogSpot Writing
ii) Case study method
iii) Citation methods
b) A researcher wants to conduct a qualitative research based on contribution made by one NGO. What would be source of related literature for reviewing the past researchers? [5]



Total No. of Questions : 8]

SEAT No. :

P4090

[Total No. of Pages : 2

[5155] - 340
M.E. (Semester - II)
PETROLEUM ENGINEERING
Advanced Reservoir Engineering
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Answer any five questions.*
- 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.*

- Q1)** a) What are the five types of reservoirs that are encountered? Explain with appropriate figures. **[5]**
- b) Calculate the mass of methane gas contained at 1000 psi and 68 degree F in a cylinder with volume of 3.20 cu ft. Assume that methane is an ideal gas. **[3]**
- c) Calculate the density of methane, at the conditions given in above problem? **[2]**
- Q2)** a) What do you mean by reserves? Explain all types of reserves in detail.**[5]**
- b) What do you mean by areal and vertical sweep efficiency? Explain with figures. **[3]**
- c) What do you mean by the z-factor? Explain its relevance. **[2]**
- Q3)** a) Explain how is chemical EOR methods are different than thermal EOR methods. **[5]**
- b) Write a detailed note on MEOR. **[3]**
- c) What do you mean by ASP flooding? What is the contribution of each of the individual elements? **[2]**

P.T.O.

- Q4)** a) Write a detailed note on in-situ combustion, along with an appropriate diagram. [5]
 b) What do you mean by CO₂ flooding? How different is it from inert gas flooding? [3]
 c) Explain in detail, how interfacial tension is important in EOR? What are its units, and how does it affect the transition zone. [2]
- Q5)** a) What do you mean by wettability, and how does it affect an EOR strategy? [5]
 b) What do you mean by reaction kinetics? Explain its relevance. [3]
 c) Explain what you mean by transient, pseudo-steady and steady state flow regimes in detail. [2]
- Q6)** a) What do you mean by relative permeability and relative permeability ratio? Explain with diagrams. [4]
 b) What is the difference between SAGD and Huff-and-puff method? Explain in detail. [4]
 c) Write a short note on saturation and effective permeability. [2]
- Q7)** a) Dry air is a gas mixture consisting essentially of Nitrogen, oxygen, and small amounts of other gases. Calculate the apparent molecular weight of air, given its composition: [5]
- | Component | Composition, mole fraction |
|-----------|----------------------------|
| Nitrogen | 0.78 |
| Oxygen | 0.21 |
| Argon | 0.01. |
- b) Thermal EOR, with its screening criteria. [5]
- Q8)** a) Explain in detail, what do you mean by LTO and HTO. [5]
 b) Calculate the partial pressure exerted by Methane in the following gas, when the gas is at a pressure of 750 psia. Assume that the gas is a mixture of ideal gases: [5]
- | Component | Composition, mole fraction |
|-----------|----------------------------|
| Methane | 0.85 |
| Ethane | 0.10 |
| Propane | 0.05 |



Total No. of Questions : 8]

SEAT No. :

P4091

[Total No. of Pages : 2

[5155] - 341

M.E. (Semester - II)

PETROLEUM ENGINEERING

Environmental Technology in Petroleum Engineering

(2013 Credit Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Attempt Any Five 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) Explain in brief the recent environmental problems confronted Petroleum Industry. [4]
b) Write a brief note on: Quality Environment Management [3]
c) Discuss in brief Planning and resource allocation and quality practices. [3]
- Q2)** a) How NORM is formed through petroleum operations? What safety measures are taken for management and discarding of NORM? [4]
b) Explain the environmental impact of discharge in onshore and offshore areas during drilling operations. [4]
c) Write a brief note on: Procedures for oilfield waste management. [2]
- Q3)** Write notes on: [10]
a) CO₂ Sequestrations.
b) Integrated Environmental Biotechnology in Petroleum Industry.
- Q4)** a) Discuss the principle involved in Clean Development Mechanism. [4]
b) Explain in brief environmental control of drilling fluid and produced water. [4]
c) What is Environmental Impact Assessment? [2]

P.T.O.

- Q5)** Write notes on: **[10]**
- a) HAZOP and HAZAN.
 - b) Hazard Identification.
- Q6)**
- a) Discuss the principles of ATR and safe work processes with suitable examples. **[4]**
 - b) Explain brief the accidents in Oil and gas Industries. **[4]**
 - c) Write a note on: Contingency plans for Environmental Management. **[2]**
- Q7)**
- a) Write brief note on: **[5]**
 - i) Disaster management in offshore installation.
 - ii) QRA
 - b) Explain the various causes and preventive measures in petroleum industry for fire and explosion hazards. **[5]**
- Q8)** Write notes on: **[10]**
- a) Health and Safety laws applicable in Oil and Gas Industries.
 - b) Disaster Management.



Total No. of Questions : 8]

SEAT No. :

P4092

[Total No. of Pages : 2

[5155] - 342

M.E. (Petroleum)

ADVANCED PRODUCTION ENGINEERING

(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) Discuss the applications of Gilbert chart in vertical lift performance, analysis. [5]
- b) Explain the working and design of a sucker rod pumping system. [3]
- c) Describe jet pumping system. [2]

- Q2)** a) Classify different types of gas lift valves. Draw neat schematic sketch of any one type of gas lift valve and explain the working of it. [5]
- b) Discuss in brief, graphical method to design single point of gas injection system. [3]
- c) Write procedure for sizing of a horizontal separator. [2]

- Q3)** a) Which gas lift method you will recommend for high P.I. and high BHP wells? Why? [4]
- b) Explain working of a GGS. [4]
- c) Draw neat schematic sketch and explain well perforation job in brief. [2]

P.T.O.

- Q4)** a) Classify different methods of well completion and explain any one in detail. [5]
 b) Discuss important objectives in the design and optimization of a surface production facility. [3]
 c) Draw neat schematic of flow patterns or flow regimes for a vertical wellbore. [2]
- Q5)** a) Describe in detail, inflow and outflow performance of a wellbore. [6]
 b) Discuss design considerations for an emulsion treating equipment in detail. [4]
- Q6)** a) Write general considerations in gas lift design. [4]
 b) Write efficiency of intermittent gas lift only in terms of excellent/good/fair/poor in a tabular form for well parameters such as, high PI, high GOR, adaptability to deviated wells, capability to produce sand, high volume lift capability, deep wells and ability to handle viscous oil.[3]
 c) When plunger lifting is more suitable than any other lifting technique? Explain the working of it. [3]
- Q7)** a) Compare between matrix acidization and hydraulic fracturing from the point of skin factor, pressure loss, permeability, hydraulics during the job, improvement in effective wellbore radius, PI, flow efficiency and IPR. [5]
 b) Which ALT has excellent ability to handle solids and viscous oil for a depth up to 5000 ft.? Describe the working of it in brief. [5]
- Q8)** a) Derive an equation to calculate closing pressure under operating conditions for a casing pressure operated gas lift valve. [5]
 b) Why horizontal wells are useful to improve the productivity of a reservoir? Write their advantages and applications. [5]



Total No. of Questions : 8]

SEAT No. :

P4093

[Total No. of Pages : 2

[5155] - 343
M.E. (Semester - III)
PETROLEUM ENGINEERING
Advanced Well Testing
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Answer any five questions.*
- 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.*

- Q1)* a) State the laws which are used for deriving the diffusivity equation, and explain each one of them in detail. [5]
b) What is meant by ETR, MTR and LTR? Explain in detail. [3]
c) What is the relevance of transient, pseudo steady state and steady state flow regime in well testing? [2]
- Q2)* a) What do you mean by the continuity equation? What are the assumptions that are used to derive the same? [5]
b) Explain the concept of superposition in space, with appropriate diagrams. [3]
c) Write down the assumptions for deriving the line source solution of the diffusivity equation. [2]
- Q3)* a) What are the objectives of a well test? Explain in detail. [5]
b) What do you mean by DST? Explain with its different time phases.[3]
c) What is the significance of the multiple buildups and drawdowns in a DST? [2]

P.T.O.

- Q4)** a) How is an isochronal test different from a modified isochronal test? [5]
b) Explain why a gas well test is different from an oil well test. [3]
c) Explain what is meant by pseudo pressure. [2]
- Q5)** a) What do you mean by method of images? [5]
b) Plot pseudo-pressure function vs. pressure, with the help of a graph. Explain. [3]
c) Explain the various slopes that are observed in a typical well test. [2]
- Q6)** a) Explain the three types of empirical decline curves. [4]
b) What do you mean by IPR and VLP? What happens when they intersect? [4]
c) What happens when you change the node position in Nodal Analysis? Explain with graphs. [2]
- Q7)** Write short notes on:
a) Types of graphs used in decline curve analysis. [5]
b) Analytical decline curves. [5]
- Q8)** Explain in detail, what do you mean by :
a) Various solutions to the diffusivity equation. [5]
b) Bourdet derivative and its impact on pressure transient analysis. [5]



Total No. of Questions : 6]

SEAT No. :

P4094

[Total No. of Pages : 2

[5155] - 344
M.E. (Petroleum Engineering)
ADVANCE WELL CONTROL
(2013 Pattern)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) Discuss causes of abnormal pressures in detail. **[5]**
- b) Influx volume = 10bbl, SIDPP = 600 Psi **[5]**
SICP = 750 psi , TVD = 9,000ft
Mud density = 11ppg , Drill collar = 500 ft,
Annular volume against drill collar = 0.03 bbl/ft
MAASP= 1,200 psi with 11ppg Mud
Calculate influx gradient and maximum influx volume that can be safely shut in.
- Q2)** a) Explain effect of choke line friction loss in brief. **[2]**
- b) Calculate Formation pressure, BHP while making connection **[4]**
Well depth = 11,900ft MD, 9,600ft TVD
Formation pressure gradient 0.65psi/ft
Mud density 12.4 ppg
Annular pressure loss @ 90 spm
Minimum swab pressure 80 psi
- c) What are early signs of Kick while drilling? **[4]**

P.T.O.

- Q3)** a) Explain gas influx behavior in open well migration in detail. [5]
 b) Explain volumetric method in detail with suitable example. [5]
- Q4)** a) Discuss stripping operation in detail. [6]
 b) A well started flowing after pulling out 20 stand of drill pipe. It was decided to strip the pipe back in to the hole and circulate out the influx using driller's method. Well data given as [4]
 Well depth 10,000ft, Mud in use 12 ppg,
 Drill pipe displacement = 0.0082 bbl/ft
 Av. Stand length = 92ft
 5" drill pipe capacity = 0.0178 bbl/ft
 Calculate: Amount of mud to be bled off after stripping in one stand and amount of mud to be filled in pipe after one stand.
- Q5)** a) Discuss any four unusual situations in well control. [4]
 b) Explain and draw subsea BOP stack. [6]
- Q6)** a) Explain subsea control pod of BOP and discuss working in brief with suitable diagram. [6]
 b) Write short Note on : [4]
 i) Underground blow out.
 ii) Cup tester.



Total No. of Questions : 8]

SEAT No. :

P4095

[Total No. of Pages : 2

[5155]-345

M.E. (Printing Engg. & Graphics Communication)

**PROBABILITY, STATISTICS AND REGRESSION ANALYSIS
(2013 Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any Five questions.*
- 2) *Assume suitable data if necessary.*

Q1) Explain probability and random variables with their importance. **[10]**

Q2) From a group of three Indians, four Japanese and five Americans, a subcommittee of four people is formed by drawing lots. What is probability that a subcommittee contains. **[10]**

- a) 2 Indian, 2 Japanese
- b) 1 Indian, 1 Japanese & 2 Americans.
- c) All 4 Americans

Q3) Explain control chart for variables and attribute. **[10]**

Q4) The values of different sample values are given below. Compute centreline, upper control, lower control limits for X-bar and R-chart? **[10]**

Value	Sample	2	3	4	5
X-bar	10.5	10.4	10.0	10.5	9.8
R-Chart	2.1	1.3	0.4	1.2	2.3

P.T.O.

- Q5)** Explain OC-curve characteristics [10]
- Q6)** Explain different SQC Tools. [10]
- Q7)** Explain Flow chart for planning an experiment. [10]
- Q8)** Explain Quality Improvement Tools? [10]



Total No. of Questions : 3]

SEAT No. :

P4096

[Total No. of Pages : 1

[5155]-346

M.E. (Printing) (Semester - I)

PRINTING TECHNOLOGY MANAGEMENT

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*

Q1) a) State different packaging products in the market today. **[9]**

b) Why different designs are considered. **[9]**

OR

Explain functions and scope of production department of a newspaper press. **[18]**

Q2) a) How is ISO significant in the production of newspaper production. **[8]**

b) State and explain any one ISO standard that is used for newspaper. **[8]**

OR

a) Explain what is DMAIC.

b) Why quality control procedure is necessary in CTP process.

Q3) State various classification of forecasting methods. **[16]**

OR

What is acceptance sampling? Define and explain with suitable examples.



Total No. of Questions : 3]

SEAT No. :

P4097

[Total No. of Pages : 1

[5155]-347

M.E. (Printing Engineering & Graphic Communication)

MODERN TRENDS IN PRINTING

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Draw neat diagram wherever necessary.*
- 2) Figures to right indicate full marks.*

Q1) Explain in detail sections of a gravure press. **[18]**

OR

Explain in detail sections of a flexo press. **[18]**

OR

Explain in detail flexo process parameters. **[18]**

OR

Explain the effect of ink viscosity on gravure printability. **[18]**

Q2) Explain the working of ELS technology for a web press. **[16]**

OR

Explain the effect of impression roller press on dot fidelity. **[16]**

Q3) Mention the care and maintenance for flexo plates. **[16]**

OR

Explain the parameters affecting ink consumption. **[16]**



Total No. of Questions : 8]

SEAT No. :

P4098

[Total No. of Pages : 1

[5155]-348

M.E. (Printing Engineering & Graphics Communication)

RESEARCH METHODOLOGY

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any Five questions.*
- 2) *Assume suitable data if necessary.*

Q1) Explain types of Research. **[10]**

Q2) Explain in detail Research design. **[10]**

Q3) Explain the research status in India. **[10]**

Q4) Explain steps involved in writing report. **[10]**

Q5) Explain Design of Experiment. **[10]**

Q6) State merit & demerits of Case study. **[10]**

Q7) Explain sampling method in detail. **[10]**

Q8) Explain in brief the methods of data collection. **[10]**



Total No. of Questions : 8]

SEAT No. :

P4099

[Total No. of Pages : 1

[5155]-349
M.E. (Printing)
COLOR SCIENCE
(2013 Pattern) (End Semester)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to right indicate full marks.*

Q1) What is simultaneous contrast and retinal image? Explain. **[10]**

OR

Q2) What chromatic aberration of the eye? **[10]**

Q3) Compare and contrast between perceptibility and acceptability. **[8]**

OR

Q4) Explain normal trichromates color matching function. **[8]**

Q5) What is metamerism; explain in greater details **[16]**

OR

Q6) What are the types of ICC profiles? **[16]**

Q7) Explain the concept of color due to molecules in details. **[16]**

OR

Q8) Explain in details the concept of color reproduction by reflection. **[16]**



Total No. of Questions : 4]

SEAT No. :

P4100

[Total No. of Pages : 1

[5155]-350

M.E. (Printing Engineering & Graphic Communication)

WEB HANDLING ON PRESS

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Draw neat diagram wherever necessary.*
- 2) Figures to right indicate full marks.*

Q1) Explain the working of viewing system used on a web press. **[18]**

OR

Explain the surface treatment required on the substrate. **[18]**

OR

Explain in detail auto registration control system for a press. **[18]**

OR

Explain in detail web tension control system. **[18]**

Q2) Explain in detail web guiding system for a press. **[16]**

OR

Explain in detail deflection of rollers. **[16]**

Q3) Explain the role of web transport rollers in a press. **[16]**

OR

Q4) Write notes on : **[16]**

- a) Roller Deflection
- b) Roller Coverings.



Total No. of Questions : 5]

SEAT No. :

P4101

[Total No. of Pages : 1

[5155]-351

M.E. (Printing Engineering)

SUBSTRATE & INK

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*

Q1) What do you mean by substrate sizing? What are the chemicals used for sizing? **[10]**

Q2) Explain effect of 'Calendaring' treatment in paper. **[10]**

Q3) Discuss effect of paper properties on missing dots in gravure printing. **[10]**

Q4) Explain various types of specialty inks used in different printing processes. **[10]**

Q5) Discuss Environmental and Pollution Prevention Laws to be observed in Gravure and Flexographic printing process. **[10]**



Total No. of Questions : 3]

SEAT No. :

P4102

[Total No. of Pages : 1

[5155]-352

M.E. (Printing Engineering and Graphic Communication)

PRINTED ELECTRONICS & RFID

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Assume suitable data wherever necessary.*
- 3) Figures on right indicate marks.*

Q1) a) Discuss functional inks and substrates for use in printed electronics.[6]

b) Comment on Printed electronics and its scope in near future with suitable case if any. [6]

c) Explain any one of the traditional methods for electronics manufacturing? [6]

Q2) Discuss various applications of Printed Electronics. [16]

Q3) Write down in detail RFID working. Why RFID will replace barcodes in supply chain? [16]



Total No. of Questions : 3]

SEAT No. :

P4103

[Total No. of Pages : 1

[5155]-353

M.E. (Printing Engineering & Graphic Communication)
ADVANCES IN CONVERTING AND PACKAGING
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Draw neat diagram wherever necessary.*
- 2) Figures to right indicate full marks.*

Q1) Explain the finishing techniques used for publication. **[18]**

OR

Explain the Dry Lamination technique. **[18]**

OR

Explain in detail Coating process. **[18]**

OR

Explain the finishing process for a package. **[18]**

Q2) Explain in detail Blown extrusion process. **[16]**

OR

Explain the role of PE in packaging. **[16]**

Q3) Explain in detail packaging process to increase the shelf life of a product. **[16]**

OR

Explain in detail retort packaging. **[16]**



Total No. of Questions : 8]

SEAT No. :

P4104

[Total No. of Pages : 2

[5155]-354

**M.E. Production (CAD/CAM)
COMPUTER AIDED DESIGN
(2013 Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4 and Q5 or Q6.*
- 2) Q7 and Q8 are compulsory.*
- 3) Figures to the right indicate full marks.*
- 4) Draw neat self – explanatory sketches wherever necessary.*
- 5) Use of calculator is allowed.*
- 6) Assume suitable data, if necessary.*

Q1) Discuss the benefits of CAD/CAM to engineering design as compared to conventional methods. **[5]**

OR

Q2) Explain the importance of various stages of product life cycle. **[5]**

Q3) Write down the various techniques used for the construction and editing of solid objects. Explain any two of them in detail. **[5]**

OR

Q4) What is Homogeneous Co-ordinate system? Explain the necessity of Homogeneous co-ordinate system for transformation of geometric entities using suitable examples. **[5]**

P.T.O.

Q5) Explain the procedure of mass property calculations in CAD software. [7]

OR

Q6) What is blending of curves? Explain how two Bezier segments can be blended with suitable numeric example. [7]

Q7) a) What sweep representation scheme used for representation of a solid.[8]

b) What is Z-buffer algorithm for B-REP and CSG model? [7]

OR

Q8) Write short note on any three: [18]

a) Constructive solid geometry.

b) Shading algorithms.

c) Virtual Realism.

d) Parametric programming.



Total No. of Questions : 6]

SEAT No. :

P4105

[Total No. of Pages : 2

[5155]-355

M.E. (Production Engineering) (CAD/CAM)
COMPUTER AIDED MANUFACTURING
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

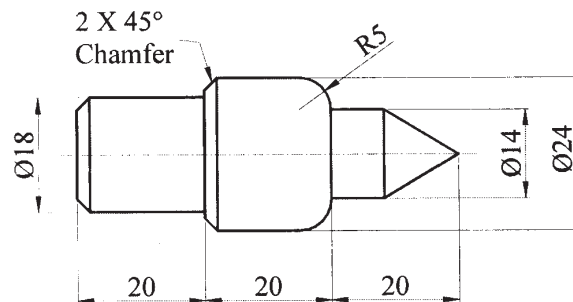
- 1) *Answer Q1 OR Q2, Q3 OR Q4; and Q5 & Q6 are compulsory.*
- 2) *Assume suitable data if necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) a) Explain principal of ball screw used in CNC machine tool. [5]

b) Explain concept of virtual machining. [5]

OR

Q2) Write NC program for the following job and also explain meaning of each step (block). [10]



Q3) Write short note on (any two) : [10]

- a) CNC wire electro discharge machining.
- b) Automated guided vehicle system.
- c) Robot welding.

OR

- Q4)** a) Explain working principle of automatic press with block diagram. [5]
b) Explain use of robot in ASRS system. [5]
- Q5)** a) Explain contact and non-contact method of inspection. [8]
b) What are the various in processes automated measuring methods? Explain in short. [7]
- Q6)** a) Explain the need and method of factory data collection system. [7]
b) Explain the need Human workers in future automated factory and What is impact of it on society? [8]



Total No. of Questions : 6]

SEAT No. :

P4106

[Total No. of Pages : 2

[5155]-356

M.E. (Production) (CAD/CAM)

ADVANCED MATHEMATICS AND STATISTICS

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answers 3 questions from Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Reduce the quadratic form $8x^2 + 7y^2 + 3z^2 - 12xy + 4xz - 8yz$ to the canonical form by an orthogonal reduction and discuss its nature. Also find the modal matrix. **[8]**

b) Show that the transformation **[8]**

$$y_1 = 2x_1 + x_2 + x_3$$

$$y_2 = x_1 + x_2 + 2x_3$$

$$y_3 = x_1 - 2x_3$$

is regular, write down the inverse transformation.

OR

Q2) a) If $A = \begin{bmatrix} 2+i & 3 & -1+3i \\ -5 & i & 4-2i \end{bmatrix}$, Verify that A^*A is a Hermitian matrix. **[8]**

b) Solve the boundary value problem $y'' + y + x = 0$ ($0 \leq x \leq 1$), $y(0) = y(1) = 0$ by Galerkin's method. Compare your solution with the exact solution. **[8]**

P.T.O.

- Q3)** a) Solve by the method of Laplace transform the equation $y'' + y' - 2y = t$ with $y(0) = 1, y'(0) = 0$. [9]
- b) Obtain Fourier series to represent $f(x) = x^2 - 2$, when $-2 \leq x \leq 2$. [8]

OR

- Q4)** a) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, which satisfies the conditions: [9]

$$u(0, y) = u(l, y) = u(x, 0) = 0, u(x, a) = \sin \frac{n\pi x}{l}$$

- b) Solve the integral equation [8]

$$\int_0^{\infty} f(x) \sin \lambda x dx = e^{-\lambda}$$

- Q5)** a) A random variable X has the following Probability Distribution: [9]

X:	0	1	2	3	4	5	6	7	8
P(x):	a	3a	5a	7a	9a	11a	13a	15a	17a

- i) Determine the value of a
- ii) Find $p(X < 3), p(X \geq 3), P(2 \leq X < 5)$
- b) Discuss the state variable model and its advantage's over differential equation model. [8]

OR

- Q6)** 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 $p[|x - 2| < 2]$. [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'. [8]



Total No. of Questions : 6]

SEAT No. :

P4107

[Total No. of Pages : 2

[5155]-357

M.E. (Production) (CAD/CAM)

**DESIGN OF EXPERIMENTS & RESEARCH METHODOLOGY
(2013 Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer Q1 OR Q2, Q3 OR Q4 and Q5 & Q6 are compulsory.*
- 2) Assume suitable data if necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Neat diagrams must be drawn wherever necessary.*

Q1) a) What is mean by experimental research? Explain in short. **[5]**

b) Explain research process with flow chart **[5]**

OR

Q2) a) What are the different types of Problem Solving techniques? Explain any one in short. **[5]**

b) Write short note on Delphi Method. **[5]**

Q3) a) Explain process of formulation of model based on simulation. **[5]**

b) Explain Factorial Experimental Design with its limitations. **[5]**

OR

Q4) a) Explain the terms Replication, Randomization and Blocking. **[5]**

b) Defined Heuristics and what are the reason of using it in research methodology. **[5]**

Q5) a) Explain the method of fitting response curves and response surfaces.
And how it help in analyzing the data. **[8]**

b) Explain two factor factorial design. **[7]**

Q6) Write short notes on: **[15]**

a) Format for report writing.

b) ANOVA.

c) Format of Publication in Research Journals.



Total No. of Questions : 8]

SEAT No. :

P4108

[Total No. of Pages : 2

[5155]-358

M.E. (Production) (CAD/CAM)

COMPUTER INTEGRATED MANUFACTURING

(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4 and Q5 or Q6.*
- 2) Q7 and Q8 are compulsory.*
- 3) Figures to the right indicate full marks.*
- 4) Draw neat self – explanatory sketches wherever necessary.*
- 5) Use of calculator is allowed.*
- 6) Assume suitable data, if necessary.*

Q1) Describe the need for CIM and the issues addressed by CIM. **[5]**

OR

Q2) What are the components of PLM software? Explain. **[5]**

Q3) Prepare a chart showing the data required and data generated in the various sections of a manufacturing Industry. **[5]**

OR

Q4) What is database? What are the objectives and disadvantages of a database? **[5]**

Q5) Describe the principle of an automated storage and retrieval system used in FMS. **[7]**

OR

Q6) What are the different types of drives used in robots? Explain. **[7]**

P.T.O.

Q7) a) “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]**

b) Describe the three basic network topologies. **[7]**

Q8) Write short notes on any three : **[18]**

a) Robotic inspection.

b) Network operating systems.

c) AGV in CIM.

d) GKS implementation in a CAD workstation.



Total No. of Questions : 6]

SEAT No. :

P4109

[Total No. of Pages : 2

[5155]-359

**M.E. (Production) (CAD/CAM)
FINITE ELEMENT ANALYSIS
(2013 Pattern) (Semester - II)**

Time : 3 Hours]

[Max. Marks : 50

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 non-programmable calculator is allowed.*
- 5) Assume suitable data. if necessary.*

- Q1)** a) Enlist different methods of weighted residuals and any one in brief. [5]
b) Discuss engineering applications of Finite Element Method by considering Equilibrium, Eigen value and Propagation problems. [5]

OR

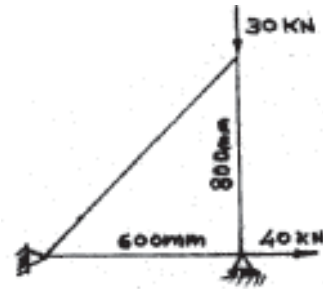
- Q2)** a) Explain the effect on element aspect ratio on accuracy. [5]
b) Write stress strain equations for axi-symmetric problems? [5]

- Q3)** a) Derive expression for elemental stiffness matrix for 3-noded 1-D bar elements. [4]
b) A three bar truss is shown in Figure 2. Modulus of elasticity of the material 2×10^5 N/mm². The cross sectional area of the element is 50 mm². [6]

P.T.O.

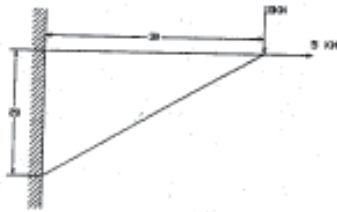
Determine :

- i) The element stiffness matrix
- ii) Global stiffness matrix
- iii) Nodal displacement
- iv) Stresses in each element
- v) Reaction force.

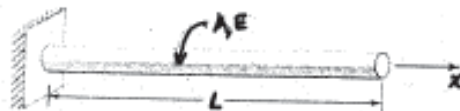


OR

- Q4)** a) Determine shape function in for CST element in terms of natural co-ordinate systems. [4]
- b) A 2D plate loaded is shown in figure. Determine the displacements of nodes using the plane stress condition. Ignore body forces. Determine the reaction forces also stress in the elements. Assume thickness as 10 mm, $E = 70 \text{ GPa}$ & $\mu = 0.3$ [6]



- Q5)** a) Derive the element stiffness matrix and stress vector for frame element. [7]
- b) Derive expression for consistent load which varies linearly from P_1 at node 1 to P_2 at node 2 on a beam element of length l_e . [8]
- Q6)** a) Differentiate between consistent mass matrix and lumped mass matrix. [5]
- b) Using two equal length finite elements, determine the natural circular frequencies of the solid circular shaft fixed at end as shown in figure below. [10]



Total No. of Questions : 6]

SEAT No. :

P4110

[Total No. of Pages : 2

[5155]-360

**M.E. (Production) (CAD/CAM)
OPTIMIZATION TECHNIQUES
(2013 Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 & Q6 are compulsory.*
- 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, necessary.*

Q1) a) Explain Kuhn-Tucker conditions. **[6]**

b) Explain Multivariable optimization techniques. **[4]**

OR

Q2) a) Identify the optimum points of the following functions. Find the optimum function values. **[6]**

i) $f(X) = (x^3 - 10x - 2x^2 + 10)$

ii) $f(X) = (x - 1)^2 - (0.01x^4)$

b) Explain steps for Fibonacci method for one dimensional minimization problem. **[4]**

Q3) Write short note on any two: **[10]**

- a) Evolutionary optimization method.
- b) Simplex search method.
- c) Newton's method.

OR

- Q4)** a) What is the difference between the interior and extended interior penalty function method? [6]
b) What is exterior penalty? Explain it with suitable example. [4]
- Q5)** a) What do you mean by Nontraditional Optimization Algorithms. Explain any one in brief.. [8]
b) Explain working principles of Genetic Algorithms with respect to coding, fitness function, GA operators. [7]
- Q6)** a) Explain Comparison of TOC and Local Optimization Approaches. [8]
b) Briefly describe Optimized Production Technology (OPT). [7]



Total No. of Questions : 6]

SEAT No. :

P4111

[Total No. of Pages : 2

[5155]-361

M.E. (Production Engineering) (CAD/CAM)

ADVANCED STRESS ANALYSIS

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Question no 5 & 6 are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) Explain stress deviator tensor and its invariants. Express von Mises stress in terms of second invariant of stress deviator tensor. **[10]**

OR

Q2) Determine the stress fields that arise from the following stress functions : **[10]**

i) $\phi = Ax^2 + Bxy + Cy^2$

ii) $\phi = Ax^3 + Bx^2y + Cxy^2 + Dy^3$

where A, B, C and D are constants.

Q3) Explain experimental procedure to plot S-N curve. **[10]**

OR

P.T.O.

Q4) 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. **[10]**

$$\frac{da}{dN} = 6.87 \times 10^{-12} (\Delta K)^3, \text{ where } da/dN \text{ is in m/cycles and } \Delta K \text{ is in MPa } \sqrt{\text{m}},$$

Also $\Delta\sigma = 200 \text{ MPa}$.

Q5) a) Justify how conformal mapping provides a convenient means to find elasticity solutions to interior and exterior problems of complex shape. **[10]**

b) Write note on X-ray technique. **[5]**

Q6) 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 $\gg 10\text{mm}$. **[15]**

Initial crack radius in (mm)	Final crack radius (mm)
1	10
1	20
2	10
2	20

Discuss the relative sensitivity of N_{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. :

P4112

[Total No. of Pages : 3

[5155]-362

M.E. (Production) (CAD/CAM)

COMPUTER AIDED PRODUCTION PLANNING

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4 and Q5 or Q6.*
- 2) Q7 and Q8 are compulsory.*
- 3) Figures to the right indicate full marks.*
- 4) Draw neat self – explanatory sketches wherever necessary.*
- 5) Use of calculator is allowed.*
- 6) Assume suitable data, if necessary.*

Q1) Discuss different measures of forecast errors. **[5]**

OR

Q2) Explain ALDEP use in facility planning.

Q3) Explain how the GT cell is formed? Discuss with example. **[5]**

OR

Q4) Discuss use of quadratic assignment model adding new machines to existing facility.

Q5) Explain Generative type of Computer Aided Process Planning (CAPP). **[7]**

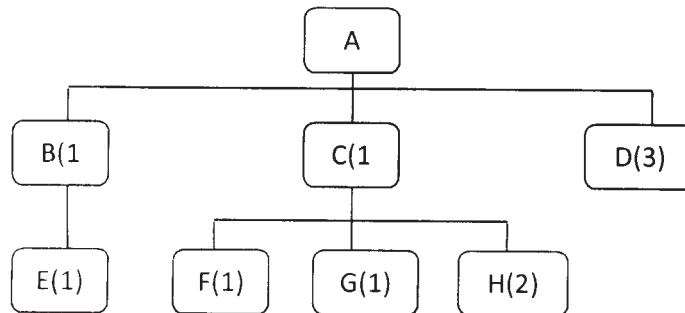
OR

Q6) Discuss ERP implementation issues.

- Q7) a) 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

- b) Product structure is as below: [7]



Inventory status of individual components are as shown

Product	Lead Time	EOQ	Opening stock	On Order
A	3	500	50	0
B	5	700	100	0
C	4	800	20	0
D	2	3000	2000	0
E	6	1200	0	0
F	3	900	70	0
G	2	1000	0	0
H	3	4000	3300	0

The demand for the product 'A' is 500 on day 16. Prepare MRP for all items.

Q8) Write short notes (Any THREE) :

[18]

- a) MRPII
- b) Gantt chart
- c) Software for ERP
- d) CDS algorithm for sequencing
- e) Random number generation



Total No. of Questions : 8]

SEAT No. :

P4113

[Total No. of Pages : 3

[5155]-363

M.E. (Production - Manufacturing & Automation)

MATHEMATICS AND STATISTICS

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any 5 Questions Out of 8 Questions.
- 2) Neat diagrams should be drawn whenever necessary.
- 3) Figure to the right indicate full marks.
- 4) All questions carry equal marks
- 5) Use of Logarithmic tables slide rule, Mollier charts, electronic pocket calculator and stem tables is allowed.
- 6) Assume suitable data, if necessary.

Q1) a) Show that $u = y^3 - 3x^2y$ is a harmonic function. Find it's harmonic conjugate and the corresponding analytic function. [5]

b) Evaluate, $\oint_C \frac{2z^2 + z + 5}{\left(z - \frac{3}{2}\right)^2} dz$ where C is the circle *Ellipse* $\frac{x^2}{4} + \frac{y^2}{9} = 1$. [5]

Q2) a) Solve the boundary value problem $y'' - y + x = 0$, $0 \leq x \leq 1$; $y(0) = y(1) = 0$; by Rayleigh-Ritz method. [5]

b) Find the curves on which the functional $\int_0^1 (y'^2 + 12xy) dx$ with $y(0) = 0$ and $y(1) = 1$ can be extremised. [3]

c) State the Lagrange's equation in generalized co-ordinates. [2]

P.T.O.

Q3) a) Solve the equation [5]

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} \text{ subject to the conditions } u(x, 0) = \sin \pi x, 0 \leq x \leq 1;$$

$$u(0, t) = u(1, t) = 0 \text{ carry out computations for two levels, taking } h = 1/3,$$

$$k = 1/36.$$

b) Explain the standard 5-point formula to solve the Laplace equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0 \quad [3]$$

c) Classify the equation $y^2 u_{xx} - 2y u_{xy} + u_{yy} - u_y = 8y$. [2]

Q4) a) Find the map of the line $y - x + 1 = 0$ by the transformation $w = \frac{1}{z}$ and sketch also find the map of $y - x = 0$ [5]

b) By using series expression for $J_n(x)$ derive $\frac{d}{dx} [x^n J_n(x)] = x^n J_{n-1}(x)$. [5]

Q5) a) Expand $f(z) = \frac{1}{(z-2)(z-1)}$ in the region $1 < |z| < 2$ as Laurent's series. [5]

b) State Rodrigue's formula and prove that $P_2(x) = 1/2(3x^2 - 1)$. [3]

c) State necessary and sufficient conditions for $f(z) = u(x, y) + iv(x, y)$ to be analytic in a region R. [2]

Q6) a) Find the mean recurrence time for each state of the following Markov chain. [5]

$$P = \begin{bmatrix} 0.33 & 0.33 & 0.34 \\ 0.25 & 0.25 & 0.5 \\ 0.2 & 0.6 & 0.2 \end{bmatrix}$$

- b) A tire company claims that the lives of the tires have mean of 42000 kilometers with standard deviation of 4000 kilometers. A change in the production process is believed to result in a better product. A test sample of 81 new tyres has a mean life of 42500 kilometers. Test at 5% level of significance that the new product is significantly better than the current one. [5]

- Q7)** a) Fit a Poisson distribution to the following set of observations. [5]

x	0	1	2	3	4
f	57	41	28	8	1

- b) Prove that $J_{-1/2}(x) = \sqrt{\left(\frac{2}{\pi x}\right)} \cos x$ [5]

- Q8)** a) A group of boys and girl's were given an intelligent test. The mean score, standard deviation and numbers in each group are as follows [5]

	Boys	Girls
Mean	124	121
Standard Deviation	12	10
Numbers	18	14

Is the mean score of boys significantly different from that of girls.?

Given $t_{30, 0.05} = 2.04$

- b) The mean and variance of a binomial distribution are 5 and 5/2 respectively. Find $P[X \leq 1]$. [5]



Total No. of Questions : 8]

SEAT No. :

P4114

[Total No. of Pages : 3

[5155]-364

M.E. (Production - Manufacturing & Automation)

INDUSTRIAL AUTOMATION

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 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.*

Q1) a) Explain with neat sketch principal of working of electro-hydraulic servo valves. **[4]**

b) An external gear pump having gears with pitch circle diameter 100 mm, number of teeth 25 and face width 40 mm delivers 401 pm at 1440 rpm. Calculate volumetric efficiency of pump. **[4]**

c) With neat sketch explain function and working of 4×3 direction control valve. **[2]**

Q2) a) A power door opening system must be controlled with a timed cycle. Operators need to activate the door cycle from both inside and outside by pushing a button. The door needs to remain open for an adjustable time period before it automatically closes. The operators must also have a means to keep the door open continuously when needed. **[4]**

b) Calculate the required size of the receiver that must supply air to the pneumatic system consuming $0.85 \text{ m}^3/\text{min}$ for 10 min. between 8.275 bar and 6.895 bar pressure before compressor resumes operation. What size is required if the compressor is running and delivering air at $0.17 \text{ m}^3/\text{min}$. **[4]**

P.T.O.

- c) Draw symbols: [2]
- i) Vacuum pump
 - ii) Semi-rotary actuator.
- Q3)** a) Explain Microprocessor-8085 with pin diagram. [4]
- b) Write a microprocessor program to: [6]
- Actuate cylinders 3 and 6 through solenoid valves s3 and s6 operated by respective switches.
 - Even if other switches of the other input port are made ON, other corresponding cylinders should not actuate.
 - Considering switches s2, s6, are s7 are ON at particular time, Display answer at port-1.
- Q4)** a) Explain design aspects of hydraulic reservoir. [5]
- b) Double acting cylinder is used to perform forward and return motion. Pneumatic cylinder is advanced by pressing push buttons PB1. Cylinder is returned by pressing push button PB2. Draw the pneumatic circuit, PLC wiring diagram and ladder diagram to implement this task. [5]
- Q5)** a) For a particular AGV, average distance traveled per delivery is 150 m, average distance traveled empty is 100 m, total handling time is 90 sec. and vehicle velocity is 50 m/min. Determine number of vehicles needed to satisfy the demand of 40 deliveries/hr. and also the handling system efficiency. Assume traffic factor to be 0.9. [4]
- b) How will you determine number of machines, number of bays and number of rows in AS/RS system? [4]
- c) What is the function of orienter and selector in automated feeder system? [2]

- Q6)** a) Explain position control systems in robotics. [4]
b) Explain teaching pendant method for robot programming. What are its limitations and advantages? [6]
- Q7)** a) What are various methods for fuzzy decision making? [4]
b) Explain use of neural network as prediction tool. [4]
c) Explain use of RFID for automatic data collection in factory automation. [2]
- Q8)** Write short notes on:
a) Robot programming for foundry. [5]
b) Guiding technologies for AGV. [5]



Total No. of Questions : 8]

SEAT No. :

P4115

[Total No. of Pages : 2

[5155]-365

M.E. (Production - Engineering) (Manufacturing Automation)

ADVANCED MANUFACTURING PROCESSES

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data if necessary.*
- 5) Use of electronic pocket calculator and logarithmic tables is allowed.*

- Q1)** a) How pure metals are solidifying during casting? [4]
b) How blow molding process take place? [4]
c) Which major limitations of conventional machining overcome by non-conventional machining processes? [2]
- Q2)** a) How laser beam machining works? [4]
b) What you mean by heat affected zone (HAZ) in EDM process? [4]
c) How will you reduce sand casting defects caused by moulds? [2]
- Q3)** a) On which principle of Electro Chemical machining (ECM) work. [4]
b) How to minimize welding defects occurs during fusion welding? [4]
c) Is there any difference between destructive and Non-destructive testing of castings? [2]

P.T.O.

- Q4)** a) Which are the major advantages and limitations of Electro Discharge Machining (EDM). [5]
b) Suggest some their causes and remedies for welding defects. [5]
- Q5)** a) Wire of 5 mm diameter is reduced to 3 mm diameter. Calculate drawing stress and drawing load. Die angle is 100 and the coefficient of friction at die and wire interface is 0.25. The flow stress of wire material is 430 N/mm². calculate motor power required if drawing speed is 0.1 m/s. Determine the maximum possible reduction. [8]
b) Write two names of non-conventional forming processes. [2]
- Q6)** a) How metal spinning processes take place? [4]
b) Is there any difference between hot forming and cold forming? [4]
c) What is high energy rate forming? [2]
- Q7)** a) Explain important process parameters of electro-hydraulic forming. [4]
b) A tube of 22 mm external diameter and 1 mm thickness is to be reduced to 19 mm external diameter and 0.5 mm thickness. The die angle is 24° and plug angle is 16°. The coefficients of friction at die and tube interface and tube and plug (mandrel) interface is 0.5. The flow stress of tube material is 340 N/mm². The tube drawing is carried at a speed of 0.4m/s. Calculate the fixed plug. [4]
c) What is ironing? [2]
- Q8)** a) What you mean by forming limit diagram. [5]
b) Which are various rolling problems? [5]



Total No. of Questions : 8]

SEAT No. :

P4116

[Total No. of Pages : 3

[5155]-366

M.E. (Production - Manufacturing & Automation)

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.
- 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.

- Q1)** a) Explain objectives of research. [4]
- b) Explain difference between conceptual and empirical research. [4]
- c) State any four methods of field research. [2]

- Q2)** a) Explain with suitable example 'After only with control' design. [4]
- b) In a two way analysis of variance, variable x is having five levels and variable y is having 4 levels as shown in Table 2. Determine the selection of which variable affects the process significantly? (Assume f_{critical} values for column and row are 3.49 and 3.24 respectively). [4]

	y_1	y_2	y_3	y_4
x_1	65	40	20	60
x_2	50	70	40	40
x_3	40	70	40	55

- c) Explain the term "Confounded relationship" in context of research design. [2]

- Q3)** a) Explain limitations of interview method of data collection. [4]
 b) Explain characteristics of case study method. [4]
 c) Discuss: Tomkins-Horn picture arrangement test. [2]

- Q4)** a) Write short notes on: [10]
 i) Formulation of a research problem
 ii) Projective techniques of data collection.

- Q5)** a) In a bearing manufacturing industry, 1.75 % of bearings are defective. What is the probability that in 525 such bearings 1.5% or less are defective 'The areas under standard normal curve are as shown in Table. Assume linear interpolation for values in between. [4]

z	0.1	0.2	0.3	0.4	0.5	0.6
Area under curve	0.0398	0.0793	0.1179	0.1554	0.1915	0.2257

- b) For the following data, determine the relation between variables x_1 and x_2 and response Y using multiple regression method. Also determine the quality of fit. [4]

x_1	23	17	16	14	10
x_2	0.78	0.66	0.17	0.13	0.66
Y	167	147	162	145	125

- c) Explain use of neural network as a prediction tool ? [2]

- Q6)** a) Apply' TOPSIS method to select most appropriate material. Attribute data for the various materials is shown below. [4]

Material	Toughness index	Yield Strength (MPa)	Young's Modulus (GPa)	Density, (g/cm ³)
1	75.5	420	74.2	2.8
2	95	91	70	2.68
3	770	1,365	189	7.9
4	187	1,120	210	7.9
5	179	875	112	4.43

Toughness index, yield strength, Young's modulus are to be maximized and density to be minimized. The weights of the attributes Toughness index, yield strength, Young's modulus, and density are 0.20, 0.30, 0.25, and 0.25 respectively.

- b) 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?[4]
- c) What is permanent of a matrix? [2]
- Q7)** a) Explain techniques for proper interpretation of a research report. [4]
- b) Explain mechanics of writing a research report. [4]
- c) Write note on Layout of a research report. [2]

Q8) Write short notes on: [10]

- a) Genetic algorithm.
- b) Graph theory and matrix approach.



Total No. of Questions : 8]

SEAT No. :

P4117

[Total No. of Pages : 3

[5155]-367

M.E. (Production - Manufacturing & Automation)
COMPUTER INTEGRATED MANUFACTURING
(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 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.*

- Q1)** a) Explain various steps involved in conventional animation. **[4]**
b) Write notes on Phong shading and Gourand shading. **[4]**
c) How do you do trimming for a curve? **[2]**

- Q2)** a) Explain the meaning of the following statements in a part programme. **[4]**

N01 G90 G71 G94 EOB

N02 G00 X0 Z1 EOB

N03 G01 Z0 EOB

N04 G02 X10 Z-5 10 K-5 F150 EOB

N05 G01 Z-15 EOB

P.T.O.

- b) What are the fixed cycles? How do they differ from a subroutine? Discuss how a fixed cycle can be useful in writing a part programme. [4]
- c) Explain motion statements in APT. [2]
- Q3)** a) Obtain element stiffness matrix for a straight and a curved axi-symmetric shell. [4]
- b) Give details of analyzing a metal forming process using FEA with an illustration [4]
- c) Explain the concept of FEM briefly. [2]
- Q4)** a) Write a note on automatic mesh generation with an illustrative example.[5]
- b) Explain in detail the Generative approach in CAPP. [5]
- Q5)** a) Write a note on SQL. [4]
- b) Explain briefly the functional requirements and specifications that CAD/CAM database must support. [4]
- c) Explain various users of DBMS in brief. [2]
- Q6)** a) Bring out the differences between material requirements planning and manufacturing resource planning. [4]
- b) Write a note on Capacity planning. [4]
- c) What do you mean by shop floor control? [2]
- Q7)** a) Explain the DEC model of CIM. [4]
- b) How is material handling carried out in FMS? Explain. [4]
- c) What are the elements of FMS? [2]

- Q8)** a) Apply the rank order clustering technique to the part—machine incidence matrix in the following table to identify logical part families and machine groups. **[5]**

		Parts					
Machines ↓		A	B	C	D	E	F
1						1	
2		1			1		1
3			1				
4		1		1	1		
5			1			1	
6				1	1		1

- b) Write a note on cellular manufacturing. **[5]**



Total No. of Questions : 8]

SEAT No. :

P4118

[Total No. of Pages : 3

[5155]-368

M.E. (Production - Manufacturing & Automation)

TOOL AND DIE DESIGN

(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 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.*

- Q1)** a) Design a parting tool for cutting off $\phi 22$ tool steel bars to limit deflection up to 0.05 mm. Assume Side clearance angle = 2° , Back rake angle = 8° , Feed/rev.= 0.5. **[4]**
- b) Determine the maximum temperature along rake face of a tool when machining a steel material having shear stress 400×10^6 N/m². Rake angle = 0° , relative velocity of tool and workpiece = 2 m/s, thickness of uncut layer = 0.25 mm, width of material = 2 mm, coefficient of friction = 0.5, density of material = 7200 kg/m³, thermal conductivity of material = 43.6 W/m°C, specific heat of material=502 J/kg°C, Initial temperature of work material=400°C. Use Lee and Shaffer shear angle relationship.**[4]**
- c) Calculate the side rake and back rake angles when the inclination angle is 3° , orthogonal rake is -7° and side cutting edge angle is 12° . **[2]**

P.T.O.

- Q6)** a) Draw the configuration of an injection mould for producing PVC box having internal undercut as shown in Fig. 2. [6]

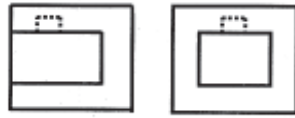


Fig. 2

- b) What is gate seal point? What is its significance? [4]
- Q7)** a) Explain general steps for design of die casting dies. [4]
- b) Explain die design parameters affecting the shrinkage porosity of die casting. [4]
- c) List materials most suitable for die casting. Give justification. [2]
- Q8)** a) Derive expression for determining most economic number of cavities in injection molding. [5]
- b) Write note on: Design of finishing impression for forging die. [5]



Total No. of Questions : 8]

SEAT No. :

P4119

[Total No. of Pages : 2

[5155]-369

M.E. (Production) (Manufacturing and Automation)

ADVANCED JOINING PROCESSES

(2013 Credit Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of non-programmable electronic pocket calculator and statistical tables is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) What is Welding? Name the principal forms of arc welding differing in the manner of weld shielding against exposure to atmospheric air. [4]
- b) Discuss the factors which are considered in choosing a welding process for a specific application. [4]
- c) Write the equations used in the strength analysis of welds. [2]
- Q2)** a) Describe the working principal of Plasma Arc Welding process with a neat sketch. [4]
- b) Briefly describe the important features of Laser Beam Welding process. [4]
- c) Enumerate the various applications of Ultrasonic Welding. [2]
- Q3)** a) What characteristics are desired in a welding heat source. [4]
- b) Briefly discuss the necessity of conducting destructive testing of welds. Why standard specimens are used for testing? State the basic considerations in choosing a test of mechanical properties. [4]
- c) With neat sketches describe the faulty weld profiles on a butt and fillet welds. [2]

P.T.O.

- Q4)** a) How can distortion be controlled in weldments? Name the types of distortion in welded plates and articles. [5]
b) Describe the stovepipe technique in pipeline welding. [5]
- Q5)** a) Describe the effect of polarity on metal transfer and melting rate. [4]
b) Describe how the melt of rate and the deposition rate are calculated. [4]
c) What makes spray metal transfer superior to globular metal transfer? [2]
- Q6)** a) Discuss thermal and mechanical treatments of welds. What common thermal treatments are carried out on welds. [4]
b) Briefly discuss the isothermal transformations. Time Temperature Transformations in steel. [4]
c) What is HAZ in welding? Why a weld usually fails in HAZ area? [2]
- Q7)** a) Explain in a brief the hot air welding technique for welding of PVC plastics. [4]
b) Describe with an example the use of friction welding technique for welding plastic components of circular cross section. [4]
c) Draw a neat sketch of a test specimen with a butt joint to find out the strength of plastic sheets. [2]
- Q8)** a) With a suitable example explain how the weld metal solidifies and crystallizes. [5]
b) Explain the different stages of Dip Transfer in MIG/MAG welding with a neat diagram. [5]



Total No. of Questions : 8]

SEAT No. :

P4120

[Total No. of Pages : 3

[5155]-370

M.E. (Production) (Manufacturing & Automation)

ADVANCED ROBOTICS

(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions
- 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

- Q1)** a) How is a robot analogous to human arm? Explain. [4]
- b) Discuss the difficulties encountered while using a robot for continuous arc welding operation. [4]
- c) Define robot. [2]

- Q2)** a) How are the rotated frames mapped? Derive the rotation matrix. [4]
- b) Given two points $a_{uvw} = (1, 5, 7)^T$ and $b_{uvw} = (2, 4, 6)^T$ with respect to the rotated OUVW coordinate system, determine the corresponding points a_{xyz} and b_{xyz} with respect to the reference coordinate system OXYZ if it has been rotated 60° about OZ axis. [4]
- c) What do you mean by forward and inverse kinematic problem? [2]

P.T.O.

- Q3)** a) A part weighing 15 lb is to be grasped by a mechanical gripper using friction between two opposing fingers. The coefficient of static friction is 0.35 and the coefficient of dynamic friction is 0.20. The direction of the acceleration force is parallel to the contacting surfaces of the gripper fingers. Which value of coefficient of friction is appropriate to use in the force calculations? Why? Compute the required gripper force assuming that a g factor of 2.0 is applicable. [4]
- b) What is PID control? Why is the integral term important? [4]
- c) What are the drawbacks of using adhesive gripper? [2]
- Q4)** a) Discuss the factors considered in gripper selection and design. [5]
- b) Explain the use of robots in spray coating application. [5]
- Q5)** a) Describe various generations of robot languages. [4]
- b) What is walk-through programming? Explain. [4]
- c) Discuss advantages and disadvantages of online programming. [2]
- Q6)** a) Explain rotary encoders used for sensing position in robots. [4]
- b) Write a note on proximity sensors used in robots. [4]
- c) Name some contact and non contact type sensors. [2]
- Q7)** a) Explain D-H parameters d , θ , a , α . [4]
- b) Write a note on prismatic joint Jacobian. [4]
- c) What is Jacobian of a manipulator? [2]

- Q8)** a) The local gradient function values of an 8×8 image are shown in the figure below. Determine the edges of the object in the image by choosing the appropriate threshold value of gradient function. **[5]**

2	5	6	3	3	2	1	2
1	9	1	8	9	9	2	1
1	8	6	3	4	7	10	2
3	8	4	2	6	2	9	3
4	10	5	6	5	6	8	3
6	9	6	5	4	2	9	1
3	5	8	9	10	8	6	2
1	2	1	3	1	3	2	2

- b) Explain MOTION commands in robot language. **[5]**



Total No. of Questions : 8]

SEAT No. :

P4121

[Total No. of Pages : 2

[5155]-371

M.E. (Production Engineering) (Manufacturing & Automation)

SURFACE ENGINEERING

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data, if necessary.*
- 5) Use of electronic pocket calculator and logarithmic tables is allowed.*

Q1) a) What is corrosion? List out some of the harmful effects of the corrosion of industrial parts. **[4]**

b) Define surface Engineering. List out and explain important surface dependent engineering properties of materials. **[4]**

c) Write short note of metal corrosion prevention. **[2]**

Q2) a) Differentiate between mechanical cleaning and chemical cleaning of industrial parts. **[4]**

b) Describe various factors to be considered while selecting the cleaning method of industrial parts. **[4]**

c) Differentiate between diffusion and ion implantation. **[2]**

P.T.O.

- Q3)** a) Write short notes on:
- i) Carburising [4]
 - ii) Nitriding [4]
- b) List out some reasons of surface hardening of industrial parts. [2]
- Q4)** a) Describe the factors which control the corrosion rate. [5]
- b) What you mean by fatigue life of industrial part? List out the factors which affect the fatigue life. [5]
- Q5)** a) Explain following with sketch:
- i) Physical Vapor Deposition [4]
 - ii) Chemical Vapor Deposition [4]
- b) What is Sol-Gel Processing. [2]
- Q6)** a) Describe four non-destructive methods of measuring coating thickness. [8]
- b) Suggest suitable coating hardness testing method for following: [2]
- i) Steel, Cu, Al, Zn & Mg
 - ii) Hard rubber & Plastics
- Q7)** a) Explain desirable requirements for high temperature metallic coatings. [4]
- b) State the basic difference between oxidation/corrosion resistant coating and thermal barrier coating. [6]
- Q8)** a) Describe any two methods of measuring coating hardness. [5]
- b) Write note on: 'Thermal degradation of metallic coatings during oxidation'. [5]

