

Total No. of Questions : 8]

SEAT No. :

P3397

[Total No. of Pages : 4

[4660] - 1

M.E.(Civil) (Construction & Management) (Semester - I)

MATHEMATICS

(2008 Pattern)

Time : 4 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Attempt any three questions from Section - I and Section - II.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic table, slide rules, Mollier charts, electronic calculator and steam table is allowed.*
- 5) *Assume suitable data wherever necessary.*

SECTION - I

- Q1)** a) Explain the importance of Probability and probability distribution in construction and management in civil engineering. [6]
- b) In a bolt factory machines M_1 , M_2 , M_3 manufactures 25, 35 and 40 percent of the total by respective machines of their output 5, 4, and 2 percent are defective bolts respectively. One bolt is chosen at random from the product and found to be defective. What is the probability that it is manufactured by the machine M_2 ? [6]
- c) A random variable has the following probability distribution. [6]

x	:	4	5	6	8
p (x):		0.1	0.3	0.4	0.2

Find the expectation and standard deviation of the random variable.

P.T.O.

Q2) a) Explain with examples applications of normal distribution in Civil Engineering. [8]

b) In a certain factory turning out products there is a small chance $\frac{1}{500}$ for any product to be defective. The product are supplied in a packets of 10. Calculate the approximate number of packets containing no defective, one defective and two defective products in a consignment of 10,000 packets. Given $e^{-0.02} = 0.9802$. [8]

Q3) a) Explain Griff's waiting line model applications in equipment management with an example. [8]

b) Explain in detail : [8]

i) Vorster - Sears Model

ii) Vorster - Garza Model

Q4) Kalasagar is planning to market a new product which requires an investment of Rs. 75,000. The product is expected to have life cycle of one year. With the help of private consultant the management has projected the probabilities of various levels of selling price, variable cost and sales volumes as under :

Selling price	Probability	Variable cost	Prob	Sales Vol ^m	Prob.
50	0.25	25	0.20	4000	0.20
60	0.50	35	0.60	5000	0.40
70	0.25	45	0.20	6000	0.40

Assuming the factors in the table to be statistically independent, conduct to simulation trials and calculate.

a) The average profit

b) Test the economic variability of the proposal if the money is borrowed at 18% per annum.

[16]

SECTION - II

- Q5) a)** Explain the role of regression analysis in resources management. [6]
- b) Calculate the coefficient of correlation between x and y series from the following data and calculate its probable error and coefficient of determination also.

x:	78	89	96	69	59	79	68	61
y:	125	137	156	112	107	136	123	108

[10]

- Q6) a)** Explain utility of quality control charts in concreting activity through a graphical representation. [8]
- b) You are given data relating purchases and sales. Obtain the two regression equations by the method of least squares and estimate the likely sales when the purchases equal to 100. [8]

Purchase (x):	62	72	98	76	81	56	76	92	88	49
Sales (y):	112	124	131	117	132	96	120	136	97	85

- Q7) a)** Explain the following : [10]
- i) Sampling methods.
- ii) EOQ - Derivation to be performed to determine optimum cost of inventory.

- b) In a certain trivariate distribution [8]

$$S_1 = 3, S_2 = S_3 = 5, r_{12} = 0.7, r_{23} = r_{31} = 0.6$$

Find

- i) Partial correlation coefficient $r_{12.3}$
- ii) Multiple correlation coefficient $R_{1.23}$
- iii) Regression coefficient $b_{12.3}$

Q8) a) In a sample of 400 parts manufactured by a factory the number of defective parts was found to be 30. The company however claimed that only 5% of their product is defective. Is the claim acceptable? Given Z at 5% level is 1.645. **[8]**

b) A simple random sample of size 36 is drawn from a finite population consisting of 101 units. If the population standard deviation is 12.6, find the standard error of sample mean when the sample is drawn

i) with replacement.

ii) without replacement.

[8]



Total No. of Questions : 8]

SEAT No. :

P3389

[Total No. of Pages : 2

[4660]-1001

M.E. (Civil) (Construction Management)
APPLICATIONS OF STATISTICAL METHODS IN
CONSTRUCTIONS
(501021) (2013 Credit Pattern) (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 the 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) Jaquar Company went for mass production of plumbing items. 5 items of each colour were packed in each boxes which were to be sold as a unit item to the customers. Due to shortage of quality was compromised and it was estimated that 20% of items were defective. If customer purchases such a box of items, what is probability that the box will have **[10]**

- i) No defective item.
- ii) 2 Defective item.
- iii) Atleast one defective item.
- iv) at most one defective item.
- v) all defective item.

Q2) a) If the mean number of equipment coming to a service counter is 3 per min what the probability that the arrival between two equipment would be more than 5 minutes. **[3]**

b) The incidence of occupational hazard in a construction industry is such that the workman has 20% chance of suffering from it. What is the probability that out of six workmen 4 or more will suffer from hazard. **[3]**

c) Explain various probability distributions with their application with typical examples in construction industry. **[4]**

P.T.O.

- Q3) a)** From the prices of two construction materials X and Y are given below, state which is more stable in value. [6]

X	55	54	52	53	56	58	52	50	51	49
Y	108	107	105	105	106	107	104	103	104	101

- b) Explain with example how various measures of dispersion are useful in quality control of concrete. [4]

- Q4)** 200 concrete blocks were chosen at random from a set of given blocks. The frequency of the blocks are given as below. [10]

Blocks	0	1	2	3	4	5	6	7	8	9
Frequency	18	19	23	21	16	25	22	20	21	15

Use the χ^2 -test to assess the correctness of the hypothesis that the blocks were distributed in equal numbers in the sample from which these numbers were taken. Value of χ^2 for 9 degree of freedom at 5% level is 16.919.

- Q5) a)** Calculate Karl Pearson's correlation coefficient between the productivity of two construction labours X and Y. [7]

X	10	25	13	25	22	11	12	25	21	20
Y	12	22	16	15	18	18	17	23	24	17

- b) Explain different methods to study correlations. [3]

- Q6)** Find the two lines of regression from following data given between two brands of paints in form of warranty. [10]

Paint A	25	22	28	26	35	20	22	40	20	18
Paint B	18	15	20	17	22	14	16	21	15	14

Hence estimate:

- i) The warranty of paint A when warranty of paint B is 19.
 - ii) The warranty of paint B when warranty of paint A is 30.
- Q7) a)** An earth excavating and loading unit loads a fleet of 6 trucks in a construction project. The trucks arrive at an average rate of 15 nos/hr and are served at an average rate of 30 nos/hr. Determine idle % of loader or utilization % of loader. [7]
- b) What is difference between regression and correlation analysis. [3]
- Q8) a)** Explain different techniques of risk analysis with example in construction management. [7]
- b) Explain utility of ABC analysis with example. [3]

Total No. of Questions : 8]

SEAT No. :

P3204

[Total No. of Pages : 2

[4660] - 1003

M.E. Civil (Construction & Management) (Semester - I)

CONSTRUCTION TECHNOLOGY

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

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

- Q1)** a) Explain problems faced during tunneling in soft soil. [5]
b) Explain the sequence of construction of R.C. diaphragm wall using bentonite slurry used for basement wall. [5]
- Q2)** a) Explain the operation of TBM in hard rock with suitable sketches. [5]
b) Explain well point system of dewatering basement foundation in cohesionless soil with high water table. [5]
- Q3)** a) List out various activities associated with concrete pump used for more than 40 storied buildings using RMC with transit mixer and pump.[5]
b) Explain with neat sketches single and double wall sheet pile coffer dam. [5]
- Q4)** a) Describe procedure adopted for dam construction using roller compacted concrete. [5]
b) List the factors affecting choice of coffer dams. [5]
- Q5)** a) Explain construction of bored cast-in-place piles with neat sketches.[5]
b) Write note on “Methods adopted for correction of tilting of well foundations”. [5]

P.T.O.

- Q6)** a) Explain how you will calculate the load carrying capacity for group of piles. [5]
b) Write note on “Pneumatic Caisson”. [5]
- Q7)** a) Explain “Log book for construction equipment - necessity and use”. [5]
b) Draw neat sketch for “Grouting equipment”. Explain the procedure of cement grouting. [5]
- Q8)** a) Write the factors affecting the choice of construction equipment used for construction of earth and rock fill dam. [5]
b) Write note on “Material handling equipments”. [5]



Total No. of Questions : 8]

SEAT No. :

P2956

[Total No. of Pages : 2

[4660]-1004

M.E. (Civil) (Construction Management) (Semester - I)

RESEARCH METHODOLOGY

(2013 Pattern)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the candidates:

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

Q1) a) Write a note on Experimental and non-experimental hypothesis – testing in research with example. [5]

b) Enlist at least 4 different research funding agencies. Explain details about any one. [5]

Q2) a) Explain the general format of a research proposal. [5]

b) What are the criteria's for a good 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 source of Literature review. [5]

b) Explain the advantages and Limitations of Likert-type Scale. [5]

P.T.O.

- Q5)** a) Write a short note on Chi-Square test as a non-parametric test of testing hypothesis. [8]
b) Enlist the Important Parametric tests for Hypothesis testing. [2]
- Q6)** a) Explain the centroid method of factor analysis. [5]
b) Explain the conditions for the application of Chi-Square test. [5]
- Q7)** a) Discuss different types of reports. [5]
b) Explain the factors to be considered for effective presenting a research. [5]
- Q8)** a) Write a note on Plagiarism in research. [5]
b) Discuss in brief the important factors needed for a Technical report. [5]



Total No. of Questions : 8]

SEAT No. :

P2957

[Total No. of Pages : 2

[4660]-1006

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

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 wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

Q1) With respect to India Contract Act (1892), Explain **[10]**

- a) Revocation of offer & Revocation of acceptance.
- b) Consequences of breach.
- c) Formation of Valid contract-essential conditions.
- d) Valid excuses for non-performance.

Q2) a) Explain the following types of dispute resolution mechanisms in brief:**[6]**

- i) Mediation
- ii) Conciliation
- iii) Dispute adjudication board

b) Explain (2AN-B) & concept of Evaluated Bid Price (EBP) with appropriate examples. **[4]**

Q3) a) Explain in brief – Particular conditions of contract. **[5]**

b) Write a note on – Duties of Arbitrator. **[5]**

P.T.O.

- Q4)** a) Explain briefly – Extra Items in Contracts. [3]
b) Draft various pre-qualification necessary to execute a Metro Rail Project of worth of 2000 crores to be completed in 3 calendar year. Assume suitable data as required. [7]
- Q5)** Write a brief meaning/Provision for following under FIDIC conditions - RED BOOK. [10]
a) Mobilization period & defect liability period.
b) Employer's personnel & Contractor's personnel.
c) Provisional sum work & Day work schedule.
d) Nominated subcontractor & Approved subcontractor.
- Q6)** a) Discuss the advantages of DRB over dispute resolution mechanism [5]
b) Explain the formation process of DRB & explain how any members gets replaced in case of necessity. [5]
- Q7)** Compare & contrast between Lump sum, cost plus & Item Rate contracts giving suitable examples. [10]
- Q8)** a) Explain briefly – Submission of tenders in three envelopes. [7]
b) Explain – Labour Contract. [3]



Total No. of Questions : 8]

SEAT No. :

P3412

[Total No. of Pages : 3

[4660] - 1007

M.E. (Civil) (Construction Management)

**PROJECT ECONOMICS AND FINANCIAL MANAGEMENT
(2013 Pattern)**

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 the 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) Explain the status of present economy and its importance in Infrastructure sector. **[5]**

b) What is working capital? State the significance of working capital management in construction management. **[5]**

Q2) a) Two projects are given below, compare the profitability of projects. **[7]**

Item	Project A	Project B
Initial value of investment (Cash outflow)	Rs. 5,00,000/-	Rs. 11,00,000/-
Present value of cash inflows	Rs. 6,00,000/-	Rs. 12,50,000/-
Net present value	Rs. 1,00,000/-	Rs. 1,50,000/-

b) What is the role of lenders Engineer? **[3]**

P.T.O.

- Q3)** Explain briefly payback period method and Average rate of return method. Compare them with NPV method, IRR method and BCR method and also comment on the choice of each method. **[10]**
- Q4)** With reference to construction company prepare Profit and Loss A/c statement. Assume suitable data of construction company. **[10]**
- Q5)** Explain in detail main sources of construction project finance. **[10]**
- Q6)** Explain the following :
- a) Venture Capital. **[3]**
 - b) Corporate tax planning. **[3]**
 - c) Cost planning and control during design and construction. **[4]**
- Q7)** Namo Cement Ltd. Company's Balance Sheet as at the end of just concluded financial year and the previous year are as under **[10]**

Balance sheet as at the end of March *(Rs. crores)*

Liabilities	2013	2014	Assets	2013	2014
Equity shares	10	10	Fixed Assets Excluding Depreciation	15	18
Reserves & surplus	4	4.4	Stock	7.6	13.2
Securities loans	8	9	Debtors	6	5.4
Bank overdraft	6	8	Cash in hand	2.4	0.4
Creditors	3	4			
Unsecured loans from promoters	-	1.6			
	31	37		31	37

Additional information about company are given below : **(Rs. crores)**

	2013	2014
Sales	40	35
Profit after tax	3	1.7

Assess the financial efficiency of the company.

Q8) With reference to Mass Transit System Explain. **[10]**

- a) Various means of finance which were used for completion of entire project from its inception.
- b) Financial ups and downs are tackled and justification with respect to success or failure of the project.



Total No. of Questions : 8]

SEAT No. :

P3437

[Total No. of Pages : 3

[4660] - 1008

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

OPERATIONS RESEARCH

(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 logarithmic tables slide rule and electronic pocket calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Explain the applications of optimization techniques in various stages of construction projects. [5]

b) Solve the following : [5]

Minimize

$$Z = 2y_1 + 3y_2$$

Subject to,

$$y_1 + y_2 \geq 5$$

$$y_1 + 2y_2 \geq 6$$

and $y_1, y_2 \geq 0$

Q2) a) Explain : [5]

i) Objective function and constraints.

ii) Convex and concave functions.

b) Solve the LP problem [5]

Maximize

$$Z = 5x_1 + 2x_2$$

Subject to,

$$2x_1 + 3x_2 \leq 150$$

$$3x_1 \leq 150$$

$$5x_2 \leq 200$$

and $x_1, x_2 \geq 0$

P.T.O.

- Q3) a)** Concrete is to be supplied from 3 RMC plants to 4 different construction sites. The unit cost of transportation from each RMC plant to each site along with demand and supply data are given below.

RMC Plant	Construction Sites				Supply
	1	2	3	4	
A	8	10	7	6	50
B	12	9	4	7	40
C	9	11	10	8	30
Demand	25	32	40	23	

Find the cost of transportation and allocation by VAM. **[5]**

- b) Explain applications of dynamic programming. **[5]**

- Q4) a)** Four jobs are to be assigned to four employees. The time taken in hours by each employee to perform each job is given below. How the jobs should be allotted, one per employee, so as to minimize the total time taken. **[5]**

Employee	Jobs			
	1	2	3	4
A	8	26	17	11
B	13	28	4	26
C	38	19	18	15
D	19	26	24	10

- b) Explain - Decision under certainty, uncertainty and risk. **[5]**

- Q5) a)** Explain "Direct Search Algorithm". **[5]**

- b) Write note on "Newton - Raphson Method of Optimization". **[5]**

- Q6)** a) Use the Fabonacci method to minimize
 $f = 3x^3 - 36x$ in the range of 0 to 10, to an accuracy of 1%. Carry out first four iterations only. [5]
- b) Describe the necessary and sufficient conditions for an n-variable function $f(x)$ to have extrema. [5]
- Q7)** a) Explain "Monte Carlo technique". [5]
- b) Explain the terms with examples : [5]
- i) Net present value
 - ii) Internal rate of return
 - iii) Pay back period
- Q8)** a) Write the applications of Queuing theory in civil engineering. Explain characteristics of queuing models. [5]
- b) Explain in detail "Replacement models". [5]



Total No. of Questions : 8]

SEAT No. :

P3390

[Total No. of Pages : 2

[4660] - 1010

M.E (Civil) (Construction Management)

**ENVIRONMENT AND ENERGY FOR SUSTAINABLE
CONSTRUCTION**

(2013 Credit 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 in detail the importance of EIA for any one of the mega civil engineering project like Multipurpose Dam or a Thermal Power Plant. **[5]**
- b) Explain what you understand by the term Public Sector Projects with suitable examples. Enlist and discuss various provision earmarked to ensure minimum pollution in the Public Sector Projects. **[5]**
- Q2)** a) Explain in detail the importance of studying socio-economic impact of a project along with its techno-economic and environmental impact assessment. **[5]**
- b) Enlist various methods of carrying out EIA. Explain in detail: fiscal impact analysis. **[5]**
- Q3)** a) Enlist various environmental laws pertaining to any civil engineering project. Explain in detail: energy conservation act 2001. **[5]**
- b) Enlist and explain the roles and responsibilities of different organizations in India related to environment and pollution control. Discuss their jurisdiction details and the procedures involved for getting clearances from these organizations. **[5]**

P.T.O.

- Q4)** a) Explain in detail how green building can help to earn carbon credits. Support your answer with a suitable example. [5]
b) Explain in detail various protocols the various nations have entered into for curbing carbon change. [5]
- Q5)** a) Discuss in detail the salient features, need and relevance of harnessing renewable sources of energy. [5]
b) Explain in detail the role of government subsidies and CSR activities for the betterment of energy and environment sector in India. [5]
- Q6)** a) Explain in detail : CDM. [5]
b) Enlist any 02 global environmental issues. Explain in detail the importance of international treaties and cooperation summits to combat these issues. [5]
- Q7)** a) Enlist and explain different collection mechanism to harness solar energy. Also discuss relative merits and limitations of each mechanism. [5]
b) Explain in detail how to convert existing Multistoreyed residential building into a green building. [5]
- Q8)** a) Explain in detail the performance factors of hydro power plants with respect to solar plants and wind energy plants with merits and limitations. [5]
b) Enlist various sources of energy. Explain in detail : biomass potential in India for meeting energy needs. [5]



Total No. of Questions : 8]

SEAT No. :

P3425

[Total No. of Pages :2

[4660] - 1011

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

TQM in Construction

(2013 Pattern) (Elective)

Time : 3 Hours]

[Maximum Marks :50

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Figures on the right indicate full marks.*
- 3) *Assume suitable data, whenever necessary.*

Q1) Discuss various barriers hindering the implementation of TQM in construction companies and give a solution to each barrier. **[5+5=10]**

Q2) Define quality, quality control, quality assurance, total quality control, and total quality management. Explain PDCA cycle and its importance with an example. **[5+5=10]**

Q3) What are the basic principles used in implementing TQM programs? Explain them in the context of the project phase of “Inviting a tender and awarding a contract” **[4+6=10]**

Q4) Prepare a checklist for QA-QC associated with execution of following activities:

- a) Concreting including reinforcement **[3+3=6]**
- b) Formwork **[2]**
- c) External plaster **[2]**

Q5) Explain with examples the 7 types of construction defects as properly classified. **[10]**

P.T.O.

Q6) Is the six sigma approach based on the normal probability distribution? If yes, how? How is six sigma useful in the construction? What are the grades of training? **[4+4+2=10]**

Q7) Enlist and explain with an example the 8 principles of the ISO 9001 “Quality Management Systems standards” **[10]**

Q8) Explain the classification adopted in the PRRT software and with an example, show how this software is really useful in reducing Rework. **[10]**



Total No. of Questions : 5]

SEAT No. :

P2958

[Total No. of Pages : 2

[4660]-1013

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

ADVANCE SOIL MECHANICS

(2013 Pattern)

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) A circular area is loaded with a uniformly distributed load of intensity 'q' per unit area. Assuming the soil mass as an elastic, isotropic and semiinfinite, derive an equation for vertical pressure below the centre of loaded area at a depth 'z'. Use Boussinesq's Analysis. **[6]**

b) Explain the terms : **[4]**

- i) Plane stress
- ii) Plain strain in soil mechanics

with suitable examples & equations.

Q2) a) Explain the concept of limiting equilibrium and factor of safety for slope stability Analysis. Also explain the general procedure for locating the critical failure surface. **[6]**

b) Explain Rebhann's Graphical method for determination of active earth pressure for retaining walls. **[4]**

Q3) What earth pressure theories would you recommend in determining the earth pressures in the case of : **[10]**

- a) Cantilever retaining wall and
- b) Gravity retaining walls? – Why?

P.T.O.

Q4) Derive the Terzaghi's three dimensional consolidation equation? State the assumptions made in derivation. **[10]**

Q5) a) Explain the procedure for plotting a flow nets in an isotropic material? Write the equation to get the rate of discharge. **[5]**

b) Write a short note on 'Directional variation of Permeability in an isotropic medium'. **[5]**



Total No. of Questions : 8]

SEAT No. :

P3430

[Total No. of Pages :2

[4660] - 1014
M.E. (Civil) (Geotechnical Engineering)
ROCK MECHANICS
(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Maximum Marks :50

Instructions to the candidates:

- 1) *Answer any 05 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.*

- Q1)** a) Enlist the various laboratory test of rocks and explain about the uniaxial compressive test (UCS) **[5]**
- b) Enlist the various types of Blasting and explain with diagram cushion blasting. **[5]**
- Q2)** a) Explain with neat sketch about the Flat Jack method for determination of stresses in rock. **[5]**
- b) Plot the simple linear viscoelastic models and their response to the creep test. **[5]**
- Q3)** a) Enlist the factors affecting on the rupture behavior of rock? describe in details about any two factors. **[5]**
- b) Explain the Mohr Coulomb failure criteria for rocks. **[5]**

P.T.O.

- Q4)** a) Write a short note on structural discontinuities in rock mass. [5]
- b) Explain graphically hydrostatic compression (volumetric compression) under mean stress with constant deviatoric stress [5]
- Q5)** a) Explain in detail design criteria for foundation anchorage [5]
- b) Describe the various types of support employed in civil engineering tunnels with their field application. [5]
- Q6)** a) Explain the term net allowable bearing pressure for rock masses. Explain the terms involved in the equation of the same. [5]
- b) Write a detailed note on Creep in Rock. [5]
- Q7)** a) Enlist the various types of Rock slopes and explain any one in detail.[5]
- b) Write a short note on Over coring. [5]
- Q8)** a) What are the rock parameters required for the analysis of underground structures. Explain any one in detail [5]
- b) Explain the method of determining the required rock support based on the rock Deformation criteria. [5]



Total No. of Questions : 8]

SEAT No. :

P2959

[Total No. of Pages : 2

[4660]-1015

M.E. (Civil) (Geotechnical Engineering)

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any five full 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 proposal. [5]
b) Distinguish the errors encountered in selecting a research problem. [5]
- Q3)** a) Write a note on "Internet as a source of literature review". [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 Factor Analysis. [5]
b) Write a note on 'Simple Regression Analysis'. [5]

P.T.O.

- Q6)** a) Discuss the important characteristics of Chi-Square test. [5]
b) Explain the centroid method of factor Analysis. [5]
- Q7)** a) Discuss the important considerations for publishing the research in a journal paper. [5]
b) Discuss about the format to be followed for a writing a research report. [5]
- Q8)** a) Write a note on Oral presentation as a technique of reporting research results. [5]
b) Write a note on "Patenting a research idea". [5]



Total No. of Questions :8]

SEAT No. :

P3392

[4660]-1017

[Total No. of Pages :2

M.E. (Civil) (Geotechnical Engineering)
ADVANCE FOUNDATION ENGINEERING
(2013 Credit Pattern) (Semester - II) (501126)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any 5 questions from 8 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 importance of geological and geotechnical prediction of soil strata while constructing the Tunnel. **[4]**

b) Draw the sketch of split spoon sampler and explain the Split-spoon Sampling method to obtain representative soil sample. **[6]**

Q2) a) Explain in detail the field vane shear test. **[3]**

b) Following observations are obtained while conducting standard penetration test at a bridge site having sandy deposit. The test is conducted at 2m below ground surface. Determine the corrected N value. **[4]**

i) Observed 'N' Value = 5

ii) Unit weight of Sand deposit 20 kN/m³

iii) Water table is at 1m below ground surface

iv) Correction factor = 1.4

c) Explain the use of distance - time graph in determining depth of sub soil strata layers in seismic refraction method. **[3]**

P.T.O.

- Q3) a)** Following data is considered in design of a 3m square footing located in dense sand at a depth of 2m. Calculate the ultimate bearing capacity for following water table positions. [6]
- i) At ground surface
 - ii) At footing level
 - iii) At 1 m below footing
- Take the moist unit weight of soil above the water table is 18 kN/m^3 and saturated unit weight 20 kN/m^3 , $C = 0$ and $\phi = 35^\circ$, $N_q = 33.0$ and $N_\gamma = 34.0$.
- b) With reference to Terzaghi's bearing capacity explain the term mixed state of local and general shear failure. [4]
- Q4) a)** Raft foundation of size $15\text{m} \times 10\text{m}$ is to be constructed on saturated clay strata at a depth of 2m. Determine the ultimate bearing capacity of raft if $C_u = 95 \text{ kN/m}^2$, $\phi = 0^\circ$. [4]
- b) Write a note on fully compensated foundation. [6]
- Q5) a)** Explain the following terms with reference to sheet piling jobs. [5]
- i) Minimum depth of penetration.
 - ii) Economic depth of penetration.
- b) Explain the terms 'free' and 'fixed' in relation to the depth of penetration of anchored sheet pile wall. [5]
- Q6) a)** Explain the significance of negative skin friction? Compute the negative skin friction for a pile installed in soft clay with pile diameter 0.45m , length of pile in compressible strata 2.5 m and undrained cohesion 10 kN/m^2 . Take $\alpha = 1$. [6]
- b) Write a note on Laterally loaded piles. [4]
- Q7) a)** Enlist and explain the stability condition of a cellular cofferdam. [5]
- b) Explain the stability analysis against 'overturning' of the cellular cofferdam under partial submergence. [5]
- Q8) a)** With help of suitable sketch discuss the different shapes of well. Explain their suitability. [5]
- b) Write a note on sinking stress of a well. [5]

EEE

Total No. of Questions : 8]

SEAT No. :

P3417

[Total No. of Pages : 2

[4660]-1018

M.E. (Civil) (Geotechnical Engineering)

CONSTRUCTION METHODS IN GEOTECHNICAL ENGINEERING

(2013 Pattern) (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) Neat diagrams / figures must be drawn wherever necessary.
- 4) Assume suitable data / information wherever required and mention it clearly.

Q1) a) Explain in detail “Construction of mat foundation for multistorey building”. [5]

b) A circular cofferdam with interlocking steel Sheet piles and of 12 m diameter was proposed for a bridge pier. Explain in detail with neat sketches the sequence of operations involved for completing the coffer dam. [5]

Q2) a) Explain in detail any three types of pile hammers used for driving precast concrete piles. [5]

b) Explain with suitable sketches construction of 30 m wide × 70 m long × 8 m deep rectangular cofferdam provided with internal bracing. [5]

Q3) a) Explain the factors affecting performance of the bottom seal of cofferdam by bucket method and tremie method. [5]

b) Write note on “Problems associated with cofferdam due to improper sheet pile sections and bracings”. [5]

Q4) a) Explain in detail “Installation of Two Stage Well Point System” for following site conditions: [5]

- i) Size of excavated pit at the base - 10 m × 18 m.
- ii) Depth of excavation - 8 m below GL.
- iii) Water table at site - 1.5 m below GL.
- iv) Soil conditions - Silty Sand.

b) Explain difficulties with poor tremie concreting. [5]

P.T.O.

- Q5)** a) Explain the method of lowering a concrete caisson into the water using inclined ramp^s/Slipways. [5]
- b) Explain the method of sinking open caisson by sand island method. [5]
- Q6)** a) Explain foundation preparations required prior to lowering of box caisson at its correct location. [5]
- b) Write note on problems during construction of pneumatic sinking of caisson. [5]
- Q7)** a) Write note on “Drilling Equipments”. [5]
- b) What do you mean by “Shield tunneling”? Write advantages and disadvantages of same. [5]
- Q8)** a) Explain in detail “full face tunneling method with supports”. [5]
- b) Explain the factors to be considered while selecting explosives for rock excavation in tunneling. [5]



Total No. of Questions: 5]

SEAT No. :

P2960

[Total No. of Pages : 2

[4660] - 1019
M.E.(Civil) (Geotechnical Engineering) (Semester - II)
STABILITY OF SLOPES AND EARTH DAMS
(2013 Pattern)

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 Bishop's method of stability analysis for finite slopes. **[6]**

- b) In order to find the factor of safety of d/s slope of an earth dam, during steady seepage, the section of the dam was drawn to a scale of 1cm= 4cm, and the following results obtained on a critical slip circle.

Area of N- rectangle = 14.4 sq.cm

Area of T- rectangle = 6.4 sq.cm

Area of U- rectangle = 6.9 sq.cm

Length of arc = 12.6 cm.

Laboratory tests have furnished values of 26° for effective angle of shear resistance and 19.5 kN/m^2 for cohesion. Determine the factor of safety of the slope. Take unit wt. of soil = 19 kN/m^3 **[6]**

Q2) a) Explain the analytical method for determination of pheratic line of an earth dam. Also derive equation to calculate discharge through the body of the dam. **[5]**

- b) What are the various causes of failurers of earth dams, and explain safety measures to avoid such failurers. **[5]**

P.T.O.

Q3) What are the desirable features of good instrumentation in an earth dam. Explain the various vertical movement devices and their tentative locations. **[8]**

Q4) a) Draw a typical layout of road embankment and explain the functions of each component parts. **[5]**

b) Why steep slope embankments are reinforced? What are the methods of reinforcing of steep slope embankments. **[5]**

Q5) a) What is land slide? What are the causes and remedial measures to protect land slides. **[5]**

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

i) Gabions.

ii) Soil nailing.



Total No. of Questions: 8]

SEAT No. :

P2961

[Total No. of Pages : 2

[4660] - 1021
M.E.(Civil) (Geotech. Engineering) (Semester - III)
Geotechnical Earthquake 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) *All questions carry equal marks.*
- 4) *Your answers will be valued as a whole.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Explain 'Size of Earthquake'. [5]
b) Explain 'Ground motion Parameters' & its estimation. [5]
- Q2)** a) Discuss the term 'Size of Earthquake'. [5]
b) Explain the steps for measurement of strong motion with the help of Seismographs. [5]
- Q3)** a) Discuss one Field Test & Two lab. Tests conducted for measurement of Dynamic soil properties. [5]
b) Explain the developments of design parameters for. [5]
i) Site specific.
ii) Code Based.
- Q4)** a) Explain 'Seismic Reflection Test'. [5]
b) Explain 'Green's Function Techniques' [5]

P.T.O.

- Q5)** a) Discuss 'Initiation & Effects of Liquefaction' [5]
b) Explain 'Goodman & Seed Approach'. [5]
- Q6)** a) Discuss the different types of EQ induced land slides. [5]
b) Discuss Dynamic Analysis for Earthdam. [5]
- Q7)** a) Explain 'seismic Design of Retaining wall'. [5]
b) Discuss 'EQ induced settlement'. [5]
- Q8)** a) Discuss various soil improvement techniques as a remedial measures for Earthquake. [5]
b) Discuss the methods utilised for mitigation of EQ effects. [5]



Total No. of Questions: 8]

SEAT No. :

P2962

[Total No. of Pages : 2

[4660] - 1022

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

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

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

Q1) a) Write the identification of domestics waste, commercial waste and hazardous waste. [5]

b) Enlist the different sources of Hazardous waste. [5]

Q2) a) What are the different types of solid waste and explain them in detail.[5]

b) Write physical, chemical and biological characteristics of solid waste.[5]

Q3) a) Write detail note on the effect on solid waste pollutant on soil properties.[5]

b) Explain composting and incineration in detail. [5]

Q4) a) Explain the design principles of the dewatering of solid waste. [5]

b) Explain the different methods used to dispose solid waste. [5]

Q5) a) Write in detail different types of land fills. [5]

b) Write detail note on "Tailing ponds". [5]

P.T.O.

- Q6)** a) Write notes on [5]
- i) Barrier materials.
 - ii) Waste containment
- b) Explain environmental monitoring around land fills. [5]
- Q7)** a) Explain engineering properties of waste and reuse of waste. [5]
- b) Write note on single liner and double liner land fills. [5]
- Q8)** a) Write note on [5]
- i) Application of Geo-synthetics in waste disposal.
 - ii) Land fill construction.
- b) Explain in detail. [5]
- i) Reclamation of old waste dumps.
 - ii) Demolition of waste.



Total No. of Questions: 4]

SEAT No. :

P2963

[Total No. of Pages : 2

[4660] - 1024
M.E.(Civil) (Hydraulic Engg.) (Semester - I)
FLUID MECHANICS
(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 logarithms tables, slide rule, electronics pocket calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Derive Bernoulli's equation along a stream line. [5]
b) Derive continuity equation in Cylindrical polar coordinates. [5]
- Q2)** a) Explain the term acceleration in the flow and indicate its components. Under what circumstances is a flow non-accelerating. [5]
b) Write short note relaxation technique. [5]
- Q3)** a) Derive equation for stream function and potential function of doublet. [4]
b) Glycerin of sp gravity 1.28 and viscosity 0.07 poise flows between two large flat parallel plates kept stationary 1.5cm apart. The rate of flow is 4.4 m³ per hour per meter width of plates. Determine the maximum velocity, maximum shear stress, pressure gradient and Reynolds number. [6]
- Q4)** a) Evaluate the stream function and velocity potential for source at Z= a. [4]
b) Derive equation for velocity distribution of laminar flow for oscillating plate. [6]

P.T.O.

- Q5)** a) Discuss hydraulically smooth and rough boundaries. [4]
b) Derive Karman integral momentum equation. [6]
- Q6)** a) Discuss development of boundary layer over flat plate. [4]
b) Discuss Karman- Pohlhausen approach for solving the Karman integral momentum equation. [6]
- Q7)** a) Discuss factors affecting transition from laminar to turbulent flow. [4]
b) Derive equation for velocity of sound when an elastic wave propagates through compressible fluid flow for adiabatic process. [6]
- Q8)** a) Derive Reynolds equation of motion. [6]
b) Derive energy equation for isothermal compressible flow. [4]



Total No. of Questions : 8]

SEAT No. :

P2965

[Total No. of Pages : 2

[4660] - 1026

M.E. (Civil) (Hydraulics Engineering) (Semester - I)
PLANNING AND MANAGEMENT OF WATER RESOURCES
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions out of eight.*
- 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 three different time horizons in economic analysis of WR project. **[5]**

b) What are the objectives of WR project. **[5]**

Q2) a) What is the necessity of planning and management of water resources. **[5]**

b) Briefly explain the characteristics of water resources systems. **[5]**

Q3) a) Calculate the purchase price of a second hand centrifugal pump to be used for a small lift irrigation scheme. The original cost of pump is Rs. 50,000/- and the spent life is 8 years. Assume salvage value as Rs.5,000/- at the useful life of 20 years. **[5]**

b) With the help of diagram explain cash flow. **[5]**

Q4) a) Explain the purposes served by a WR project **[5]**

b) What are the advantages of multipurpose project. **[5]**

Q5) a) Briefly explain : 'Forecasting future water demands' while planning a WR project. **[5]**

b) What is the overall impact of reservoir sedimentation. **[5]**

P.T.O.

- Q6)** a) Write a note on optimization of reservoir operations. [5]
b) Explain the relation between spillway capacity and design flood. [5]
- Q7)** a) Write a note on ground water assessment. [5]
b) Briefly explain Bhima-Sina inter sub-basin transfer. [5]
- Q8)** a) What are the causes of ground water pollution. [5]
b) State different discounting techniques and briefly explain any one of them. [5]



Total No. of Questions :8]

SEAT No. :

P2966

[Total No. of Pages : 2

[4660] - 1027

M.E. (Civil) (Hydraulics)

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the candidates:

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

Q1) a) Explain the errors in selecting a research problem. **[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) Discuss the factors to be considered while writing a research proposal. **[5]**

Q3) a) Write a note on “Importance of Literature review in Research”. **[5]**

b) Discuss the sources of error in measurement. **[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]**

Q5) a) Explain the Null hypothesis and Alternative Hypothesis. **[5]**

b) Write a note on ‘Principal components method of factor analysis’. **[5]**

P.T.O.

- Q6)** a) Write a note on “Analysis of Variance”. [5]
b) Explain important Non-Parametric tests for Hypothesis testing. [5]
- Q7)** a) Discuss the steps involved in publishing a research idea in a journal. [5]
b) Explain the format for writing a research report. [5]
- Q8)** a) Explain the importance of patenting a research idea. [5]
b) Write a note on “Plagiarism in research”. [5]



Total No. of Questions : 8]

SEAT No. :

P2967

[Total No. of Pages : 2

[4660] - 1029

M.E. (Civil) (Hydraulics Engineering)

OPEN CHANNEL HYDRAULICS

(2013 Pattern) (Elective - 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) What is a channel transition? What are the types of channel transitions and where are they used? [4]
- b) A triangular channel is to carry a discharge of $8 \text{ m}^3/\text{s}$. If the side slopes are 1 V to 3 H, find critical depth, critical velocity and critical slope. [6]
- Q2)** a) Give the classification of hydraulic jump. [4]
- b) Derive relation between conjugate depths for a hydraulic jump on sloping floor. [6]
- Q3)** a) Derive dynamic equation of gradually varied flow. [6]
- b) Explain adverse and horizontal slope profiles in GVF. [4]
- Q4)** a) Explain Ven Te Chow method of computation of gradually varied flow profile. [2]
- b) A rectangular channel 6 m wide carries water at a uniform depth of 1.5 m on a bed slope of 1 in 8100 and $n = 0.015$. The channel ends in an abrupt drop. Find how far upstream of the fall the depth of the flow would be 1.4 m? Use step method and take only two steps. Sketch the profile. [8]

P.T.O.

- Q5)** a) Explain method of characteristics for flood routing. [4]
b) Derive De Marchi equation for side weir [6]
- Q6)** a) Derive equation for spatially varied flow with increasing discharge. [6]
b) What is side weir? Draw possible flow profiles in a side weir. [4]
- Q7)** a) Derive Saint Venant's equation for celerity of wave. [6]
b) Write short note on progressive wave. [4]
- Q8)** a) Differentiate between gradually varied and rapidly varied unsteady flow [4]
b) Analyze dam break problem for partial lifting of a downstream gate. [6]



Total No. of Questions : 8]

SEAT No. :

P3410

[Total No. of Pages : 2

[4660] - 1030

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

SEDIMENT TRANSPORT AND RIVER MECHANICS

(2013 Pattern)

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) *Use of scientific calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) Explain the various approaches for sediment motion and also explain shield analysis in detail. **[10]**

Q2) Water flows at a depth of 0.555 m in a wide rectangular channel with bed slope 1 in 1000. The average diameter of sand grain in the channel bed is 1 mm. Comment on whether the grains are stationary or in motion? **[10]**

Q3) Determine the quantity of bed load transported through a channel using M-P-M equation with the following data : **[10]**

- a) Depth of flow 2.5 m
- b) Width of channel 3.0 m
- c) Bed slope 1 in 4000
- d) One side vertical and another having side slope 05 H:1V
- e) Manning's $n = 0.023$

P.T.O.

- Q4)** a) Explain in brief the concept of suspended load, total load, wash load. [5]
b) Explain how the Meyer - Peter and Muller equation is used to estimate the bed load transport of sediment in an alluvial channel. [5]
- Q5)** Compare Kennedy method and Lacey method for the design of an irrigation channel Also Design an irrigation channel in alluvial soil according to Lacey's method for following data : [10]
a) Full supply discharge : $35 \text{ m}^3/\text{sec}$
b) Lacey's silt factor - 0.9
c) Channel side slope 0.5 H:1 V
- Q6)** a) What is river gauging? Explain the methods of river gauging in detail. [5]
b) What do you mean by Silting of reservoir? What are the preventive and curative measures for it? [5]
- Q7)** a) What are the objective of river training and bank protection works? [5]
b) Discuss the river training works in consideration with navigation and sediment control. [5]
- Q8)** a) What are the objectives of developing the Alluvial river models. [5]
b) Explain the theory of Sediment transport through pipes. [5]



Total No. of Questions : 8]

SEAT No. :

P3433

[Total No. of Pages : 2

[4660]-1031
M.E. (Civil) (Hydraulic)
HYDROLOGY
(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) What are the utility of Depth Area Duration Analysis? Explain the procedure for developing these curves. **[6]**

b) Define unit hydrograph. State the assumption & its limitations. **[4]**

Q2) a) What is Return period & explain its importance in hydrological Analysis? **[6]**

b) Explain briefly Extreme value theory. **[4]**

Q3) a) Explain various flood estimation methods with their limitation. **[6]**

b) What is forecasting of flood? State importance of flood forecasting in hydrological Analysis. **[4]**

Q4) a) Explain application of stochastic in hydrology. What are the different methods of time series Analysis. **[5]**

b) Explain clearly Design flood & Probable maximum flood. **[5]**

P.T.O.

Total No. of Questions : 6]

SEAT No. :

P2968

[Total No. of Pages : 2

[4660] - 1033
M.E (Civil) (Hydraulics)
DAM ENGINEERING
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Black figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *You are advised to attempt not more than 05 questions.*
- 5) *Assume suitable data, if necessary.*

Q1) a) What are the methods adopted to reduce uplift in masonry dams. [2]

b) Explain 'Modes of failure' in gravity dam. [8]

Q2) a) Explain the criteria that governs the design of a gravity dam in different zones of its cross-section. [6]

b) Discuss Roller compacted concrete construction in gravity dam. [4]

Q3) a) What are the forces acting on an arch dam? [4]

b) What do you mean by 'best central angle' of an arch dam? Explain with the help of a neat sketch. [6]

Q4) a) What is meant by economic spacing of buttresses and how is it related to dam height and upstream slope of buttress dam? [6]

b) Draw a typical cross-section of a rock fill dam explaining the components in detail [4]

P.T.O.

Q5) Explain how the following parameters affect the design of an earth dam. [10]

- a) Optimum moisture content
- b) C and ϕ value
- c) Permeability of soil
- d) Sudden drawdown of reservoir.

Q6) Explain and elaborate the importance of seepage through earthen dams. [10]

Q7) a) Explain with the help of a neat sketch the 'Indian standard stilling basin'. [6]

b) Discuss any one type of an automatic gate. [4]

Q8) Write short notes on the following [10]

- a) Piezometer
- b) Inclinator
- c) Joint meter
- d) Vibrating wire pressure cell
- e) Vibrating wire settlement cell



Total No. of Questions :8]

SEAT No. :

P3393

[4660]-1034

[Total No. of Pages :4

M.E. (Civil) (Hydraulics)

OPTIMIZATION TECHNIQUES

(2013 Credit Pattern) (Semester - III) (501314)

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.*
- 5) *Use of calculator is allowed.*

Q1) a) Certain farming organization operates three farms. The output of each is constrained by available land and water in a season as shown below-[5]

Farm	Area in Ha.	Water available in Ha.m
1	200	250
2	300	330
3	150	150

Three crops A, B, and C can be grown in each of the farms. However, the total area under each crop is constrained as below due to technical and socio-economic reasons. The water requirements for each crop and associated profits are also given below-

Crop	Maximum area to be cropped in Ha.	Water consumption in Ha.m/Ha	Net profit per Ha.
A	350	1.6	Rs.800.00
B	400	1.2	Rs.600.00
C	250	1.0	Rs.200.00

Formulate a suitable LP model for maximization of profits. Rewrite the model in the standard form and list different variables in matrix form. What is its size?

b) Use steepest ascent method to maximize $f(x) = 2x_1 + 2x_1x_2 - 2x_1^2 - x_2^2$. Take initial point as (0, 0) and carry out only three iterations. [5]

P.T.O.

- Q2) a)** Solve the following 4 -user water allocation problem to maximize the total returns. Water available for allocation = 60 units, to be allocated in discrete units of 0, 10, 20,....., 60. Returns from the four users for a given allocation are given in the table below- [7]

Allocation	Returns from			
	User 1	User 2	User 3	User 4
0	0	0	-3	1
10	3	4	3	1
20	5	4	5	1
30	6	4	5	7
40	3	4	4	8
50	3	6	2	10
60	3	7	0	10

- b) Maximize $z = 2x_1 + x_2$ [3]
 St. $3x_1 + x_2 \leq 300$
 $x_1 + x_2 \leq 200$
 $x_1, x_2 \geq 0$. Solve by graphical method only.

- Q3) a)** Find the minimum of the function $f = \lambda^5 - 5\lambda^3 - 20\lambda + 5$ using Dichotomous search method in the interval (0, 5) with $\delta = 0.0001$. [5]

- b) Four types of machine tools are to be installed (purchased) in a production shop. The costs of the various machine tools & the number of jobs that can be performed on each are given below [5]

Machine tool type	Cost of machine (Rs.)	Number of jobs that can be performed
1	3500	9
2	2500	4
3	2000	3
4	1000	2

If the total amount available is Rs. 10,000, determine the number of machine tools of various types to be purchased to maximize the number of jobs performed.

Note: The number of machine tools purchased must be integers.

- Q4) a)** Minimize $z = -3x_1 + x_2 + x_3$ **[5]**
- St. $x_1 - 2x_2 + x_3 \leq 11$
- $-4x_1 + x_2 + 2x_3 \geq 3$
- $2x_1 - x_3 = -1$
- $x_1, x_2, x_3 \geq 0$. Use Big M method only.
- b) Use Fibonacci method to maximize $Z = 10x^2 - 4x^3$ in the interval $(0, 2)$ with $n = 5$ upto 3 iterations. **[5]**

- Q5) a)** Customers arrive at a bank counter manned by a single cashier according to Poisson distribution with mean arrival rate 6 customers /hour. The cashier attends the customers on first come, first served basis at an average rate of 10 customers /hour with service time exponential distribution. Find **[6]**
- i) The probability of the number of arrivals (0 through 5) during
- 1) 15-minutes interval
 - 2) 30-minutes interval
- ii) The probability that the queuing system is idle.
- iii) The probability associated with the number of customers (0 through 5) in the queuing system.
- iv) The time a customer should expect to spend in the queue.
- v) The time a customer spends before leaving the bank counter.
- b) Describe the role of “Theory of games” for scientific decision making. **[4]**

- Q6) a)** What is mean by decision making without experimentation? How is it different from other methods used in decision making? **[4]**
- b) Solve the following game **[6]**

		Player B	
		B ₁	B ₂
Player A	A ₁	30	2
	A ₂	4	14
	A ₃	6	9

- Q7) a)** Find the sequence that minimizes the total elapsed time required to complete the following tasks. Each task is processed in any two of the machines A, B and C, in any order **[6]**

	Task						
	1	2	3	4	5	6	7
Machine A	12	6	5	3	5	7	6
B	7	8	9	8	7	8	3
C	3	4	11	5	2	8	4

- b) What is simulation? When to use it? State the advantages and limitations of the simulation techniques. **[4]**

- Q8) a)** A company manufactures around 200 mopeds. Depending upon the availability of raw materials and other conditions, the daily production has been varying from 196 mopeds to 204 mopeds, whose probability distribution is given as below: **[6]**

Production/day:	196	197	198	199	200	201	202	203	204
Probability:	0.05	0.09	0.12	0.14	0.20	0.15	0.11	0.08	0.06

The finished mopeds are transported in a specially designed three storeyed lorry that can accommodate only 200 mopeds. Using the following 15 random numbers 82, 89, 78, 24, 53, 61, 18, 45, 04, 23, 50, 77, 27, 54, and 10, simulate the process to find out:

- i) What will be the average number of mopeds waiting in the factory?
 ii) What will be the number of empty spaces in the lorry?
- b) What is utility theory? Explain methods of measuring utility. **[4]**

EEE

Total No. of Questions : 8]

SEAT No. :

P3394

[Total No. of Pages : 2

[4660]-1036

M.E. (Civil-Structures)

ADVANCED MECHANICS OF SOLIDS

(2013 Credit Course) (Semester-I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions from the following.*
- 2) *Answers should be written in one answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams should be drawn wherever necessary.*
- 5) *If necessary, assume suitable data.*
- 6) *Use of nonprogrammable electronic pocket calculator is allowed.*
- 7) *Use of Cell phone is prohibited in examination hall.*

Q1) a) Obtain the differential equation of equilibrium to be satisfied by rectangular stress components acting on element in a stressed body. **[5]**

b) Derive the compatibility conditions for a three dimensional state of stress in terms of the strain components. **[5]**

Q2) a) At a point in stressed body, strain tensor is given. If Young's modulus, $E = 2 \times 10^5$ MPa and Poisson's ratio, $\nu = 0.3$ for the material, find the stress tensor at this point. **[6]**

$$\begin{bmatrix} 062 & 433 & 483 \\ 433 & 483 & 000 \\ 483 & 000 & 000 \end{bmatrix} \times 10^{-6}$$

b) Explain stress invariant in details. **[4]**

Q3) a) Explain generalized Hook's law. **[4]**

b) What is Airy's stress function? Obtain the expression for stresses for fourth degree polynomial stress function for 2D problem of elasticity. **[6]**

P.T.O.

- Q4)** a) Derive the differential equations of equilibrium in terms of polar coordinates. [5]
b) Develop the relationship between the Cartesian and polar coordinates for two dimensional problems. [5]
- Q5)** a) A cylinder has an internal diameter, $d_i = 150\text{mm}$ and external diameter, $d_o = 450\text{mm}$. It is subjected to an internal pressure, $p_i = 150\text{ MPa}$, determine the radial and circumferential stresses. Also show the variation of stresses on the cross section. [6]
b) Explain in details plane state of stress and strain. [4]
- Q6)** a) A quarter circle beam of radius R curved in plan is fixed at one end and free at the other end. It carries a vertical load P at centre. Determine the deflection at the free end and draw the shear force, bending moment and torsional moment diagrams. [5]
b) Determine the ratio of $\sigma_{\max}/\sigma_{\min}$ for a curved beam in elevation of rectangular cross section in pure bending. The radius of curvature, $R = 150\text{ mm}$ and height of cross section, $h = 100\text{ mm}$. [5]
- Q7)** a) Explain in details St. Venant's theory of torsion for prismatic bars of non-circular cross-sections. [5]
b) Obtain the expression for torsion of Elliptical cross-section bar. [5]
- Q8)** a) Explain the two approaches generally adopted to solve problems of beams of finite length resting on an elastic foundation. Which one is generally preferred, explain with reason. [4]
b) Explain in details of an infinite beam subjected to a single concentrated load related to beams on elastic foundation. [6]



[4660] - 1037
M.E (Civil - Structures)
STRUCTURAL DYNAMICS
(2013 Credit Pattern) (Semester - I) (501402)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

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

- Q1)** a) Explain what is meant by Dynamic loading and Random loading? Explain with an example. **[3]**
- b) The mass of a spring - mass - dashpot system is given an initial velocity $5\omega_n$, where ω_n is the undamped natural frequency of the system. Find the equation of motion for the system, when (i) $\xi = 2.0$, (ii) $\xi = 1.0$, (iii) $\xi = 0.2$. **[7]**
- Q2)** a) Explain Critically damped, over damped and under damped system. **[3]**
- b) A mass of 1 kg is to be supported on a spring having a stiffness of 9800 N/m. The damping coefficient is 5.9 N-sec/m. Determine the natural frequency of the system. Find also the logarithmic decrement and the amplitude after three cycles if the initial displacement is 0.003m. **[7]**

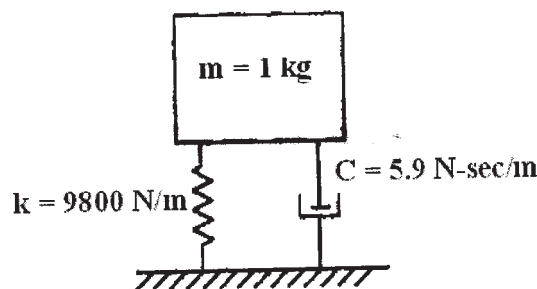


Fig. 1

P.T.O.

- Q3) a)** Derive an expression for unit impulse loading by Duhamel's Integral. [5]
- b) A weight attached to a spring of stiffness 525 N/m has a viscous damping device. When the weight is displaced and released, without damper the period of vibration is found to be 1.8 secs, and the ratio of consecutive amplitudes is 4.2 to 1.0. Determine the amplitude and phase when the force $F = 2 \cos 3t$ acts on the system? [5]

- Q4) a)** Explain Rayleigh's method to determine the fundamental frequency of vibrating structural system. [5]
- b) Estimate the approximate fundamental natural frequency of the system shown using Rayleigh's method. Take : $m = 1 \text{ kg}$ and $K = 1000 \text{ N/m}$. [5]

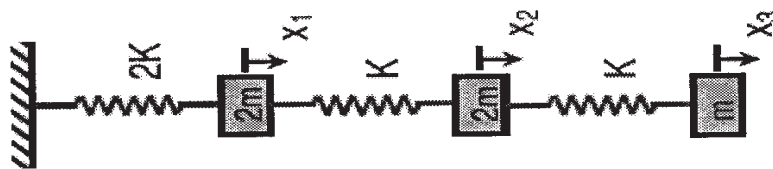


Fig. 2

- Q5) a)** What are coupled systems? Give an example. [3]
- b) Determine the natural frequencies and ratio of amplitudes of the system shown in Figure. Given [7]

$$m_1 = 1.5 \text{ kg } m_2 = 0.8 \text{ kg}$$

$$K_1 = K_2 = 40 \text{ N/m}$$

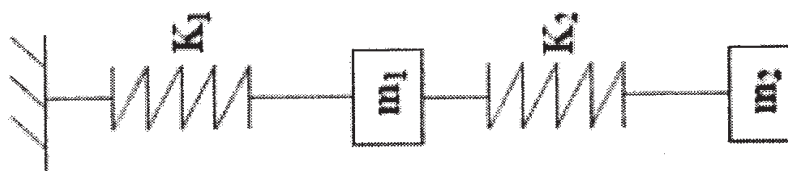


Fig. 3

- Q6)** a) Find the fundamental natural frequency and modal vector of a vibratory system shown using Stodola's method. [7]

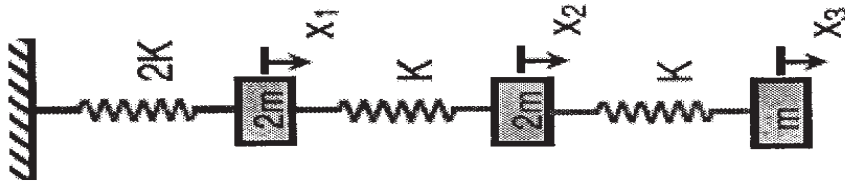


Fig. 4

- b) Write short note on Modal Participation Factors. [3]
- Q7)** a) Explain mode superposition method for MDOF system. [5]
b) Write short note on Tuned mass damper. [5]
- Q8)** Derive the general expression for natural frequency of lateral vibration of beam. [10]



Total No. of Questions : 8]

SEAT No. :

P2969

[Total No. of Pages : 3

[4660] - 1038

M.E (Civil) (Structures) (Semester - I)
ADVANCED DESIGN OF STEEL STRUCTURES
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Answer any Five from Eight Questions.*
- 2) *Neat sketches must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable calculator, IS : 800 - 2007,801,802,811 and steel tables is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) What are the different forces acting on the hoarding structures and explain the guidelines for the design of hoarding structure. **[4]**

b) The design factored forces coming in a member of a hoarding structure are 200 KN tensile and 250 KN compressive due to reversal of wind forces. Design the member using double unequal angle section back to back on opposite faces of 10 mm thick gusset plate using M20 black bolt of 4.6 grade. Assume Fe-415 grade of steel. Draw the design sketch. **[6]**

Q2) a) Write down the guidelines for web opening and stiffeners for castellated beam. **[3]**

b) Design a castellated beam in grade Fe410 steel to carry an imposed load of 3kN/m and dead load of 3kN/m over a simply supported span of 17m. Assume that the compression flange is fully restrained. **[7]**

Q3) a) Draw figures and explain typical free standing towers. **[4]**

b) A 65 m high microwave antenna lattice tower is to be built near Agra where the terrain at the site is nearly a level ground with terrain of category 2. The diameter of the hemispherical antenna disc, fixed at the top is 3 m. The width of the tower at the top is 3.5m. Select a suitable configuration for the tower and determines maximum compressive force and tension in the tower legs and also the maximum shear at the base, for the following data. **[6]**

P.T.O.

Weight of antenna disc and fixtures : 9 KN

Weight of platform at top : 0.82 KN/m²

Weight of railing at top : 0.30 KN/m²

Weight of ladder and the cage : 0.65 kN/m

Weight of miscellaneous item: 2.5kN

Q4) a) Draw figures and explain XBX - Bracing, K-Bracing, W-Bracing [4]

b) Explain structure configuration (Tower geometry) and material. State the factor considered while deciding the configuration. [6]

Q5) a) What are tubular structures? Write down its various purpose and its important advantages. [4]

b) Write short note on [6]

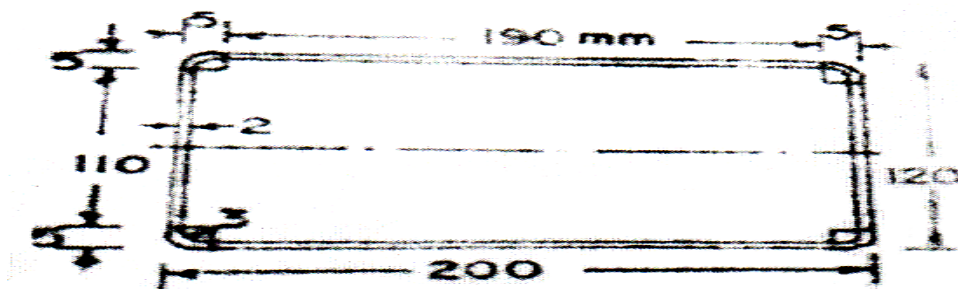
i) Connections for tubular members.

ii) Sectional properties of round tubes

iii) Tubular compression members

Q6) a) What are the advantages of light-gauge sections and draw different forms of it. [4]

b) Find the allowable load for the rectangular tubular column section show in fig. b. The effective length of column is 3.6m. Take $f_y = 235 \text{ N/mm}^2$. [6]



(a)
Fig. b

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

Height of the chimney = 80 meters

Diameter of the chimney = 4 meters

Thickness of the lining = 100 mm

Wind pressure = 1500 N/meter² on flat vertical surface

Assume suitable safe stresses

Q8) A column section ISHB 350 @ 661.2 N/m carries a factored axial compressive load of 1650 kN and factored bending moment of 90 KNm. Design the base plate and its connections.

If the factored bending moment is increased to 180 KNm redesign the base and connections.

Assume concrete pedestal of M-20 grade. [10]



Total No. of Questions : 8]

SEAT No. :

P2970

[Total No. of Pages : 2

[4660] - 1039

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

RESEARCH METHODOLOGY

(2013 Pattern)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the candidates :

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

Q1) a) With suitable example *Ex post facto* research. **[5]**

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

Q2) a) Discuss the characteristics of a good Research Problem. **[5]**

b) Explain the significance of Research in the modern times with an example. **[5]**

Q3) a) Write a note on “Internet as a source of Literature review in Research”. **[5]**

b) Enlist different types of sample designs and explain probability sampling. **[5]**

Q4) a) Explain the merits and demerits of collection of data through Observations. **[5]**

b) Write a note on “Rating scale s as a Scaling technique (with examples)”. **[5]**

Q5) a) Explain Null hypothesis and Alternative hypothesis. **[5]**

b) Explain the steps involved in procedure for hypothesis testing. **[5]**

P.T.O.

- Q6)** a) What is a t-test? When it is used and for what purpose? Explain with examples. [5]
- b) Discuss in brief the important factors needed for a Technical report. [5]
- Q7)** a) Discuss the precautions to be taken for writing Research Reports. [5]
- b) Explain Simple Regression Analysis Method. [5]
- Q8)** a) Write differences between: A research report and A research thesis. [6]
- b) When can an invention be eligible for filing of its patent? [4]



Total No. of Questions : 8]

SEAT No. :

P2971

[Total No. of Pages : 2

[4660] - 1041

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

FINITE ELEMENT METHOD

(2013 Credit Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Answer any Five from Eight Questions.*
- 2) *Neat sketches 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) Explain Principle of Minimum Potential energy. **[5]**

b) Explain variational method of deriving stiffness matrix. **[5]**

Q2) a) Derive isoperimetric relation between Cartesian and natural coordinate system for two node bar element with axial displacement at each node. Bar is oriented along X axis. **[5]**

b) Hence derive element stiffness matrix for above bar element. **[5]**

Q3) a) Enlist advantages and disadvantages of FEM. **[5]**

b) Derive strain - displacement relation for plain stress problem. **[5]**

Q4) a) Derive stiffness matrix for CST using assumed polynomial function. **[6]**

b) Illustrate with suitable example, plain stress, plain strain and axisymmetric problem. **[4]**

P.T.O.

- Q5)** a) Explain requirements of convergence of FEM solution. [5]
- b) Explain CST & LST, Give an example of each for their use in FEM. [5]
- Q6)** a) Write jacobian matrix for 2D element. [4]
- b) What are isoperimetric elements, super parametric and sub parametric elements. [6]
- Q7)** a) Write an elasticity matrix for plain strain & axisymmetric problem. [5]
- b) Explain Lagrangian interpolation. [5]
- Q8)** a) Write a note on conforming and non-conforming. [5]
- b) Transformation matrix. [5]



Total No. of Questions : 8]

SEAT No. :

P3416

[Total No. of Pages : 2

[4660]-1042
M.E. (Civil - Structures)
THEORY OF PLATES AND SHELLS
(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Attempt any five questions from the following.*
- 2) *Answers should be written in one answer books.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams should be drawn where ever necessary.*
- 5) *If necessary, assume suitable data.*
- 6) *Use of nonprogrammable electronic pocket calculator is allowed.*
- 7) *Use of Cell phone is prohibited in examination hall.*

- Q1)** a) Derive the relations between moments, curvature and deflection in pure bending of plates. **[5]**
- b) A square plate with 350 mm side and 8 mm thickness is subjected to uniformly distributed pure couple of 400 Nm on its four corners, find lateral displacement at the midpoint of the edges. Takes $E = 210 \text{ GPa}$ and $\mu = 0.3$. **[5]**
- Q2)** a) Differentiate clearly difference between Navier's and Levy's solution in the analysis of rectangular plates. **[3]**
- b) Considering a window of high rise building as rectangular plate simply supported over its edges. Plate is subjected to uniformly distributed load P_0 . Derive an expression for deflection surface using Navier method. **[7]**
- Q3)** a) Explain in brief shear deformation theories for analysis of plates. **[5]**
- b) Derive Levy's solution for rectangular plates with two opposite edges simply supported and other two are clamped under uniform intensity of loading q . **[5]**

P.T.O.

Q4) Starting from the basic principles, determine the internal forces and the deflection of a circular plate loaded with a uniformly distributed load if plate is fixed at the edge. **[10]**

Q5) a) State and explain the classification of shells on the basis of geometry with suitable sketches. **[4]**

b) Derive equation of equilibrium for thin shells with neat sketch of geometry and stress resultant. **[6]**

Q6) A thin spherical tank is supported on cylindrical rim along a parallel circle. Tank is completely filled with liquid of density 'w'. Derive an expression for the membrane stresses N_θ and N_ϕ . **[10]**

Q7) a) Explain in brief application of bending theory to pipes and pressure vessels. **[4]**

b) Analyze a cylindrical tank of uniform thickness filled with liquid using bending theory, for shells of axi-symmetrical loading. Tank is open at top and rigidly fixed at bottom. **[6]**

Q8) a) Explain in brief principle of Lundgren's beam theory. **[4]**

b) Explain in brief beam theory of cylindrical shells and its application. **[6]**



Total No. of Questions : 8]

SEAT No. :

P2972

[Total No. of Pages : 2

[4660] - 1043

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

ADVANCED DESIGN OF CONCRETE STRUCTURES

(2013 Pattern)

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 IS 456, IS 1343, IS 1893, IS 3370 & non programmable calculator is allowed.*
- 5) *Neat diagrams must be drawn wherever necessary.*
- 6) *Assume any other data if necessary.*

Q1) a) Write short note with sketches on assumptions of yield line theory. [4]

b) Draw yield line patterns for the following. [6]

- i) Rectangular slab with fixed at supports on three sides with shorter side free.
- ii) Equilateral triangular slab fixed at one of the sides, unsupported at remaining two sides and having column support at the intersection of these sides.

Q2) Design a RCC slab for a circular hall of clear diameter 5.5m using Yield Line Theory. Assume the peripheral support thickness 300mm, the slab is simply supported. Use M20 Fe500 take Live load = 5 kN/m² & floor finish load = 1.2kN/m². Draw details of reinforcement. [10]

Q3) Design a grid slab for a floor of hall 12 × 15 m c/c having square grid of 1.5m. Use M25 Fe 500 take Live load = 5.5kN/m² & floor finish load = 1.5kN/m². Apply the required check & draw reinforcement details. [10]

P.T.O.

Q4) Design a interior panel of flat slab for a hall with column spacing $6.5\text{m} \times 6.5\text{m}$ c/c the size of the column diameter is $500 \times 500\text{mm}$ each. Use M25 Fe500 take Live load = 5 kN/m^2 & floor finish load = 1.2kN/m^2 . Draw details of reinforcement. **[10]**

Q5) Design a container for circular type ESR for 1.0 lakh liters with staging height 12m using M25, Fe500 in earthquake zone IV. Safe bearing capacity is 150 kN/m^2 Design of staging is not required. Design must include Calculations of vertical loads and horizontal force calculations Draw the reinforcement details for the container only. **[10]**

Q6) Design a square bunker to store 100 tonnes of cement for the following Density of cement = 31.4 kN/m^3 , Angle of repose = 29° . Use M25 & TMT steel. Draw the details of reinforcement in side wall and hopper. **[10]**

Q7) Design Raft foundation for the following.
Centre to centre distance of column in both directions = 3 m, Column size = $350 \times 350\text{mm}$, working axial load on each column = 700 kN. The depth of the strata = 2m Use M25 & Fe 500. The safe bearing capacity of the strata = 80 kN/m^2 . Show all Analysis and Design calculations & draw the reinforcement details. **[10]**

Q8) a) Write detailed note on flanged shear wall. **[5]**

b) Write detailed note on design of formwork for box girder. **[5]**



Total No. of Questions : 8]

SEAT No. :

P3339

[Total No. of Pages :2

[4660]-1045

M.E. (Civil) (Structural Engineering)

EARTHQUAKE ENGINEERING AND DISASTER MANAGEMENT

(Semester-III) (2013 Credit Pattern) (5014013)

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.*
- 6) *Use of IS 1893, IS 13920 permitted.*

Q1) a) Define Disaster. Explain any two manmade disasters. **[3]**

b) Explain the natural disasters volcanoes and Tsunamis and explain how these will affect the structural elements in a building. **[7]**

Q2) a) What are the functions of Disaster Management Authority as related to pre disaster and post disaster activities? **[7]**

b) Write a short note on disaster management cycle. **[3]**

Q3) The plan and elevation of three storied RCC school building is shown in Figure 3.1. The building is located in seismic zone V. The type of soil encounter is medium stiff. It is proposed to design the building with special moment resistant frame. The intensity of dead load is 10 kN/m^2 and the floor are to cater to an imposed load of 3 kN/m^2 . Determine the design seismic load on the structure by static analysis. **[10]**

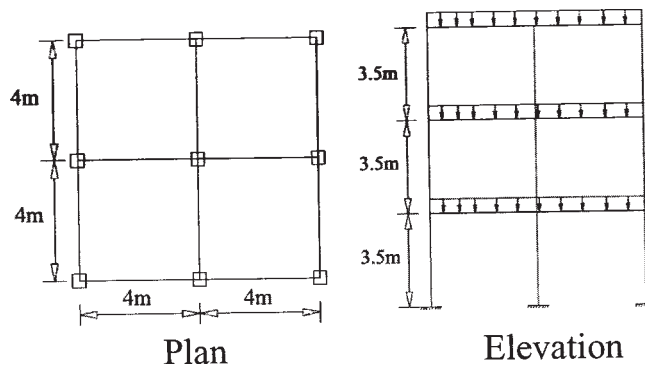


Figure3.1

P.T.O.

- Q4) a)** Explain ductility with reference to design of earthquake resistant design of structures and the factors affecting it. [5]
- b) Design a beam with ductile detailing as per the provisions of IS 13920. The beam is of 7 m span required to support a dead load of 10 kN/m inclusive of its own weight and a live load of 12 kN/m. Moment and shear force due to earthquake load is 120kN-m and 80 kN respectively. Use M 20 grade concrete and Fe 415 steel. [5]
- Q5) a)** Define any five terms: [5]
- i) Clearance Time ii) Decay Parameter
 iii) Equivalent Bare Charge iv) Mach Number
 v) Reflected Overpressure vi) Side-on Overpressure
- b) Write a note on general characteristics of Blast. Explain with proper sketch, shock wave propagation and how the pressure is developed at any surface of a structure. [5]
- Q6)** Define load mass factor. Explain the procedure to find the load mass factor K_{LM} for a single storey rigid frame with distributed masses on the roof and sides is subjected to a concentrated dynamic force $F_{(t)}$, at the roof level plus a distributed dynamic load $p(t)$ on one wall surface. [10]
- Q7)** Explain in detail the analysis of steel structure for fire loading along with the design consideration of structural steel members as per IS 800:2007. [10]
- Q8) a)** Explain the necessity of retrofitting of structures. Enlist the different retrofitting techniques. Explain any two. [5]
- b) What are the different failure modes of masonry structures? Explain any two repairing techniques in detail. [5]



Total No. of Questions : 8]

SEAT No. :

P2973

[Total No. of Pages : 3

[4660] - 1046

M.E. (Civil - Structures) (Semester - III)

DESIGN OF R.C.C. & Pr. C.C. BRIDGES

(2013 Pattern)

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) State and explain different structural forms of bridges. **[5]**

b) Write detailed note beam and slab deck bridges. **[5]**

Q2) a) Differentiate between IRC Class AA and 70R loading. **[5]**

b) Explain IRC standards for live load on road bridges. **[5]**

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

Clear span of the culvert = 5m.

Clear carriage way width = 7.5m.

Size of kerb = 200mm×600mm.

Average thickness of wearing coat 100mm.

Use material M25, 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 and calculate the maximum bending moment and shear force intermediate post tensioned prestressed concrete bridge girder for the following.

Effective span = 15m, width of carriageway = 7.5m, No. of beams 3, equally spaced along the carriageway width, Spacing of cross girders = 3m c/c, 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 and M45 & Multi-strand cables for girder. **[10]**

Q5) a) Describe different factor affecting the design of rigid frame bridge **[5]**

b) Explain with sketches, how rigid frame bridges are different from simply supported bridges. **[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 = 350 kN

Dynamic vertical load = 60 kN

Transverse lateral load = 40 kN

Longitudinal load = 50 kN

Longitudinal total translation 12 mm

Rotation at support 0.003°

Shear modulus of elastomeric bearing = 1.2 N/mm^2

Allowable comp. stress for concrete. = 8 N/mm^2

Allowable comp. stress for elastomer = 10 N/mm^2

Q7) a) Explain selection criterions for wing wall for bridges. **[5]**

b) Explain with sketches, the merits and demerits precast wing wall with geo-textile. **[5]**

Q8) Design a well foundation for a pier having base dimensions $8\text{m} \times 5\text{m}$ founded in sandy soil for the following: **[10]**

Top width of pier = 1.2m

Height of bearing above scour level = 15m

Height of pier = 7m

Total DL Reaction including Wt. of well abutment and considering buoyancy effect = $60,000\text{ kN}$

Total LL Reaction = $40,000\text{ kN}$

Total lateral force at scour level = 150 kN

C/C distance of bearing on either side of centre line of pier = 1m

BM in traffic direction due to unequal DL & LL = 500 kN-m

Material of pier and footing = M40 & Fe500

Submerged Unit wt. of soil = 10 kN/m^3

Velocity of water current = 3m/s consider the cross current also.



Total No. of Questions : 8]

SEAT No. :

P3205

[Total No. of Pages : 2

[4660] - 1048

M.E. Civil (Environmental Engineering)

ENVIRONMENTAL LEGISLATION AND MANAGEMENT SYSTEMS

(2013 Pattern)

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 indicate full marks.*
- 4) *All questions carry equal marks.*
- 5) *Your answers will be valued as a whole.*
- 6) *Use of logarithmic tables side rule, mollier charts, electronic pocket calculator and steam tables is allowed.*
- 7) *Assume suitable data, if necessary.*

Q1) Write a note on : **[10]**

- a) Polluter Pays Principle
- b) Montreal Protocol

Q2) a) Explain penalties for violation of consent conditions under Water Act 1974. **[5]**

- b) Write provisions for closure or directions in apprehended pollution situation. **[5]**

Q3) a) Write penalties for violation of consent conditions under Air Act 1981. **[5]**

- b) Explain the provision relating to prevention and control in Air Act 1981. **[5]**

Q4) a) Write objectives of Environmental Protection Agency (EPA) and explain its applications. **[5]**

- b) Explain citing criteria for industries. **[5]**

P.T.O.

- Q5)** a) Explain background and development of ISO 14000. [5]
b) Write objectives and application of ISO 14000. [5]
- Q6)** a) Write a note on Environmental Management Systems (EMS). [5]
b) Explain the role of NGO in environmental issues. [5]
- Q7)** a) Write a note on Hazardous waste (Management and Handling) Rules, 1989. [5]
b) Write powers and functions of the MPCB board under air act. [5]
- Q8)** a) Write the responsibilities of waste generators and the role of Pollution Control Boards under Hazardous Waste rules. [5]
b) Explain the provisions related to environmental issues in Indian Forest Act. [5]



Total No. of Questions : 8]

SEAT No. :

P2975

[Total No. of Pages : 2

[4660] - 1050

M.E. (Civil) (Environmental Engineering) (Semester - I)
PHYSICO-CHEMICAL PROCESS FOR WATER AND
WASTEWATER TREATMENT
(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 indicates full marks.*
- 4) *Assume suitable data if required.*

Q1) Enumerate various unit operations / processes and treatment systems used to remove major contaminants from wastewater. **[10]**

Q2) Explain with neat sketch electrical double layer around a stable particle. **[10]**

Q3) Derive an expression for settling velocity of a discrete particle governed by Stoke's Law. Also determine the basin dimensions, power required, paddle configuration and rotational speed for a flocculator which processes 100 MLD of water. By jar test, Gt value was found to be 45000. **[10]**

Q4) Differentiate between : **[10]**

- a) Attached growth processes and suspended growth processes.
- b) Aerobic treatment and anaerobic treatment.
- c) Oxidation pond and aerated lagoon.
- d) Hydraulic loading and organic loading.

P.T.O.

Q5) What is adsorption? Explain the factors affecting the adsorption. Also differentiate between physical and chemical adsorption. [10]

Q6) Discuss in detail about oxidation reduction reactions. Also write down Nernst equation for equilibrium constants and give meaning of each term. [10]

Q7) Discuss characteristics of chlorine dioxide. Also its chemistry and effectiveness. [10]

Q8) Write notes on : [10]

- a) Mechanism of filtration.
- b) Exchange Isotherm.



Total No. of Questions : 8]

SEAT No. :

P2976

[Total No. of Pages : 2

[4660] - 1051

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

RESEARCH METHODOLOGY

(2013 Pattern)

Time : 2 Hours]

[Max. Marks : 50

Instruction to the Candidates :

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

- Q1)** a) Enlist various types of Research and discuss about any one in detail. **[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]**

P.T.O.

- Q6)** a) Enlist non-parametric tests for hypothesis testing. [2]
b) Enlist Important Non-Parametric tests for Hypothesis testing and explain. [8]
- 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)** a) Write down the characteristics of a good Abstract. [5]
b) Write a note on “Steps involved in publishing a research paper”. [5]



Total No. of Questions : 8]

SEAT No. :

P3340

[Total No. of Pages : 1

[4660] - 1053

M.E (Civil) (Environmental Engg.)

INDUSTRIAL WASTE WATER MANAGEMENT

(2013 Credit Pattern) (Semester - II) (501066)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Attempt any five questions.*
- 2) Use of Non programmable calculators are allowed.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Make suitable Assumptions if necessary.*
- 5) Figures to the right side indicates full marks.*

Q1) Discuss the specific characteristics of Industrial wastewater as compared to Municipal Sewage. **[10]**

Q2) Discuss the concept of volume and waste reduction approach for Industrial Pollution Control. **[10]**

Q3) Explain the importance of equilization and Neutralization tanks for Industrial waste water management. **[10]**

Q4) Discuss the removal of heavy metal from Industrial Waste Water. **[10]**

Q5) Explain in details biological nitrification and denitrification process. **[10]**

Q6) Discuss the “Evaporation and Membrane Technologies for the treatment of Industrial Waste Water. **[10]**

Q7) Discuss the sources of effluent and manufacturing process for
a) Sugar b) Dairy **[10]**

Q8) Explain the concept of CETP. Discuss the general design considerations for the same. **[10]**



Total No. of Questions : 8]

SEAT No. :

P3206

[Total No. of Pages : 2

[4660] - 1054

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

AIR POLLUTION AND CONTROL

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any five questions.*
- 2) *Figures to the right indicates 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 SOX and CO on human beings with specific concentration of gases. [5]

b) Write and explain NAAQS. [5]

Q2) a) Explain different instruments used for the measurement of meteorological parameters. [5]

b) Write and explain the formulas to determine the stack height. [5]

Q3) a) Explain Gaussian equation to determine pollutant concentration. [5]

b) Explain the plume rise and how it is estimated? [5]

Q4) a) Explain with sketches [5]

- i) Reverse jet filter
- ii) Envelope type fabric filter.

b) With reference to ESP, explain the following [5]

- i) Particle resistivity
- ii) Particle re-entrainment.

P.T.O.

- Q5)** a) Write short note on NOX control technology. [5]
b) Explain methods of automobile air pollution control. [5]
- Q6)** a) Write short note on stack emission standards. [5]
b) Explain EMP for any industry. [5]
- Q7)** a) Explain sources and measurement of odour. [5]
b) Explain the motor fuel combustion process. [5]
- Q8)** a) Explain indoor air cleaning system. [5]
b) Explain effects of indoor air pollution with respect to gases and their concentration. [5]



Total No. of Questions : 7]

SEAT No. :

P2977

[Total No. of Pages : 2

[4660] - 1055

M.E. (Civil) (Environmental Engineering) (Semester - II)
SOLID WASTE AND HAZARDOUS WASTE 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.*

- Q1)** Discuss in detail sources, classification and composition of municipal solid waste. **[10]**
- Q2)** Highlight and explain the most relevant physical properties of MSW. **[10]**
- Q3)** Describe various systems for Storage and transport of solid waste. **[10]**
- Q4)** a) Illustrate in detail occurrence of gases and Leachate in landfills. **[5]**
b) Determine the field capacity of a landfill site for the following condition, after one year of operation, and also compute the amount of water that can be held in the waste. Use density of compacted solid waste = 600 kg/m³, moisture content of waste = 25% by volume, lift after one year 6m and net annual rainfall = 400 mm. **[5]**
- Q5)** a) Discuss with flow chart the low solids anaerobic digestion. **[5]**

P.T.O.

- b) Determine area required for a new land fill site with a projected life of 20 years for the population of 15000 generating 25 kg per household per week. Assume the density of waste is 500 kg/m³ and 3.5 persons per household. A planning restriction limits the height of the landfill to 10 m. [5]

Q6) How disposal and treatment of biomedical and nuclear waste is done. [10]

Q7) What are the problems and issues of hazardous waste management? Discuss legislations made for management and handling of hazardous waste in India. [10]



Total No. of Questions : 8]

SEAT No. :

P2978

[Total No. of Pages : 2

[4660] - 1057

M.E. (Civil) (Environmental Engineering)

ENVIRONMENTAL SANITATION

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the Candidates :

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

Q1) a) List down the communicable diseases and their mode of transmission. [4]

b) Explain the diseases communicated by the discharges of intestines, nose and throat. Specify also the control measures to be taken. [6]

Q2) a) What are the fly control methods? [4]

b) What is an Insecticide? .Explain the commonly available insecticides in market. [6]

Q3) a) Describe in detail methods adopted to control Plague. [4]

b) Which disinfectants are generally used? Explain the specific use with an importance. [6]

Q4) a) Explain in detail “Industrial Plant Sanitation.” [4]

b) Discuss in detail the various problems associated with Rural Sanitation. [6]

P.T.O.

- Q5)** a) What do you understand by Low cost excreta disposal system? [4]
b) What are the occupational hazards in industry? Explain. [6]
- Q6)** a) Write a short note on Rural sanitation improvement schemes. [4]
b) Discuss about problems of water supply in rural area and their effects. [6]
- Q7)** a) Write a short note on principles governing design of building drainage. [4]
b) Explain Single Stack and One Pipe Plumbing System of Drainage. [6]
- Q8)** a) Explain intercepting trap with a neat sketch. [4]
b) What are the principles for Governing Design of Water supply in buildings. [6]



Total No. of Questions : 8]

SEAT No. :

P3424

[Total No. of Pages : 2

[4660]-1058

M. E. (Civil) (Environmental Engg.)

ENVIRONMENTAL IMPACT ASSESSMENT

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

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

Q1) Discuss the stages of EIA studies. **[10]**

Q2) a) Explain the Procedure to conduct the Public hearing. **[5]**

b) Discuss the life cycle Assessment. **[5]**

Q3) Discuss how will you obtain the basic information of our quality and Impact prediction in for Air pollutants. **[10]**

Q4) Explain how will you carry out basic information of water quality, Prediction of Impact and mitigation measures for water pollution. **[10]**

Q5) Discuss how will you Predict the impact of development activity on cultural and socioeconomic environment. Also Explain the mitigation measures. **[10]**

Q6) a) Discuss the role of public Participation in Environmental decision making. **[5]**

b) Explain the techniques for conflict management and dispute resolution. **[5]**

P.T.O.

Q7) a) Discuss the Important Provisions in EIA Notifications of 2006 of Govt. of India. **[5]**

b) Write a short Note on "Post Environmental monitoring". **[5]**

Q8) Discuss the Procedure for obtaining the Environmental clearance for construction Projects. **[10]**



Total No. of Questions :8]

SEAT No. :

P3341

[4660]-1060

[Total No. of Pages :2

M.E. (Civil) (Water Resources & Engg.)

PLANNING AND MANAGEMENT OF WATER RESOURCES

(2013 Credit Pattern) (Semester - I) (501081)

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 is the necessity of planning and management of water resources in the nation's development and also explain its aspects towards the development. **[6]**

b) Write a short note on 'Planning region and horizons' of available water resources in India. **[4]**

Q2) a) Explain non reversibility constraint in the water resources planning and management. **[5]**

b) Write the basic five feasibility test to pass any water resource project as per Indian Government rules. **[5]**

Q3) a) How the demand for irrigation water supply purposes is decided? Comment on the current status of these demands of your state? **[4]**

b) Explain the different uncertainties in water resources systems. **[6]**

Q4) a) Write the PCB Strategies for protection of water resources. **[4]**

b) New equipment is available for Rs. 200000/- and will have an expected salvage value of Rs. 70,000/- at the end of its useful life 12 years. The OMR costs are expected to be Rs. 9000/-. A used but reconditioned

P.T.O.

piece of the same equipment having OMR costs Rs. 11000/yr, an estimated life of 7 years, and salvage value of Rs. 10000/- is available for Rs. 110000/-. If the prevailing interest rate is 10 percent and expected average inflation rate over next 10 yr is 5 percent, compare the two alternatives [6]

- i) Considering the inflation and
- ii) Neglecting the effect of inflation.

- Q5)** a) Explain tangible and intangible benefits in detail. [4]
 b) Explain in detail how the conjunctive use of surface and ground water affects on the planning and management of water resources. [6]

- Q6)** a) Define resilience index and explain it through adaptive capacity and management aspect. [5]
 b) The estimated annual demand of water of a town is 900 ML with a standard deviation of 200 ML. The town's water supply system has an estimated mean capacity of 1200 ML with a standard deviation of 100 ML. Assuming that both the supply and demand are independent random normal variables, find the reliability or the probability of supply exceeding the demand; the risk; i.e the probability of the system not meeting the demand; safety margin; and safety factor. Use following table of random normal variables for 'z'. [5]

z	α	z	α
1.1	0.8643	1.3	0.9032
1.2	0.8849	1.4	0.9192

- Q7)** a) What is 'Inter Basin Water Transfer', enumerate it with suitable example. [4]
 b) Estimate the different types of costs in the economic analysis of water resources projects. [6]
- Q8)** a) Enlist two methods to improve the Ground water content to develop the ground water resources in Maharashtra state. [5]
 b) Explain the reservoir storage zones for a typical multipurpose impounding reservoir. [5]



Total No. of Questions : 8]

SEAT No. :

P2980

[Total No. of Pages : 2

[4660] - 1062

M.E. (Civil) (Water Resources and Environmental Engg.)

FLUID MECHANICS

(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 logarithms tables, slide rule, electronics pocket calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Define stream line, path line and streak line. **[6]**

b) Define the terms laminar boundary layer and laminar sublayer. **[4]**

Q2) a) Derive Euler's equation of motion. **[4]**

b) The velocity distribution in the turbulent boundary layer over a flat plate

is given as $\frac{u}{U_{\infty}} = \left(\frac{y}{\delta}\right)^{0.22}$. Obtain an expression for the displacement thickness and momentum thickness. **[6]**

Q3) a) Derive equation for stream function and potential function of a source and sink. **[4]**

b) Derive equation for velocity distribution for suddenly accelerated plate starting with Navier-Stokes equations. **[6]**

P.T.O.

- Q4)** a) Given the complex potential, $W = \log_e Z^2$, evaluate the stream and velocity functions. Identify the flow pattern. [4]
- b) Derive Navier-Stokes equations of motion. [6]
- Q5)** a) Derive boundary layer equations starting with Navier Stokes equations. [6]
- b) State Reynolds rules of averages. [4]
- Q6)** a) What is boundary layer separation? What are its effects and methods to avoid separation? [4]
- b) What are the characteristics of turbulent flow? What is pseudo turbulence, Isotropic and anisotropic turbulence? [6]
- Q7)** a) An aeroplane is flying with Mach number 2.5 at height of 10 km where temperature is -35 degrees. Find the speed of the plane. [5]
- b) Write in brief about Rayleigh and Fanno lines. [5]
- Q8)** a) Derive equation for stagnation pressure in the form $\frac{p_2}{p_1} = \left(1 + \left(\frac{k-1}{2}\right)M^2\right)^{\frac{k}{k-1}}$ where k = adiabatic index. [6]
- b) Write a short note on compressible flow around submerged bodies. [4]



Total No. of Questions : 8]

SEAT No. :

P2981

[Total No. of Pages : 2

[4660] - 1063

M.E. (Civil) (Water Resource and Environmental Engineering)

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 50

Instruction to the candidates:-

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

Q1) a) Write a note on Sources of Research problem. **[5]**

b) Write a note on Plagiarism in research. **[5]**

Q2) a) What are the components of a Research Problem? **[5]**

b) Explain the significance oral presentation of research and precautions to be taken for same. **[5]**

Q3) a) Explain the objectives of Literature review. **[5]**

b) Define sampling and discuss the different types of sampling. **[5]**

Q4) a) Explain the necessity of surveying the available literature for a research. **[5]**

b) Explain in merits of collection of data done through Questionnaires. **[5]**

Q5) a) Write a note on "Parametric tests for Hypothesis testing". **[5]**

b) Explain in brief the procedure for hypothesis testing. **[5]**

P.T.O.

- Q6)** a) Explain the z-test and t-test used for hypothesis testing. [5]
b) Explain Type I and Type II errors in context of "Testing of hypothesis". [5]
- Q7)** a) Discuss the precautions to be taken for writing Research Reports. [5]
b) What are the principles of report writing. [5]
- Q8)** a) Write differences between : [5]
i) A journal paper
ii) A research report
iii) A research thesis
b) Discuss in brief the steps in writing report. [5]



Total No. of Questions : 8]

SEAT No. :

P2982

[Total No. of Pages : 3

[4660] - 1065

M.E. (Civil) (Water Resources and Environmental Engineering)

ENVIRONMENTAL HYDRAULICS AND ENVIRONMENTAL

STRUCTURES (Semester - II)

(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 side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*
- 6) *Use data sheet.*
- 7) *Use of IS code 46 and IS code - 1983 (Part - I) - 2002.*

Q1) a) Determine velocity of flow through pipe by using Hazen Willam's formula for the following data : **[5]**

Discharge = 100 lit/min, P.F. = 1, Head available = 100 m, Take constant C = 100, Slope of line = 1:1000.

b) Explain working of s Lobe and Gear Pump with figure. **[5]**

Q2) a) A pump supplies oil at 120 lit/min to 50 mm diameter double acting cylinder. The rod diameter is 25 mm and load acting on cylinder during extension and retraction is 5 KN. Find hydraulic pressure, piston velocity and cylinder power during extension and retraction stroke. **[5]**

b) Explain any two type of flow control and pressure control valve. **[5]**

P.T.O.

- Q3)** a) Explain working of strain gauge and thermometer. [5]
b) What are the application of different actuators in hydraulic circuit. [5]
- Q4)** a) Explain the process of distillation in detail with figure. [5]
b) Explain Ion exchange process in details. [5]
- Q5)** a) A vibration system define by the parameter $m = 100$ kg. $K = 150$ N/m, $C = 4$ N s/m. Determine Damping factor, natural frequency, logarithmic discernment. [5]
b) A four storey Steel Frame structure is use for carrying pipe line in plant situated in Zone IV. The height of each floor is 4 meter and total height of RCC structure is 12 meter. The dead load and live load on each floor are as follows : On First Floor = 3000 KN, On Second Floor = 3000 KN, On Third Floor = 3000 KN, On Fourth Floor = 2400 KN respectively. The soil below foundation is assumed to be hard rock. Find out total base shear as per IS Code - 1893 - (Part - I) - 2002. [5]
- Q6)** a) An air receiver of a cylindrical portion of 5 meter length and 1.0 meter in diameter. It is closed by hemispherical ends. The pressure is not exceeding 8 N/mm². If the material is stress having yield point 250 N/mm² and if factor of safety is 3 used. Find the required thickness of the cylinder and thickness of hemispherical shape cylinder. Assume joint efficiency for both cylinders is 0.8. [5]
b) A closed vessel is to be design to withstand internal pressure of 100 MPa having inside diameter of 400 mm. Following properties may be assumed Yield strength = 300 MPa, Ultimate Tensile strength = 600 MPa, Poission ratio = 0.4, Estimate wall thickness on the basis of [5]
i) Maximum Principle Stress Theory
ii) Maximum Shear Stress Theory

Q7) a) A pressure vessel consist of a cylindrical shell of inside diameter 2000 mm. Which is closed by cylindrical head with a crown radius of 1200 mm. The operating pressure inside the cylinder is 4 MPa. The yield strength of the material is 400 MPa. The corrosion allowance is 2 mm and weld efficiency is 80%. Determine the thickness of cylindrical shell and the cylindrical head. **[6]**

b) What are different types of head used in pressure vessel. **[4]**

Q8) a) Determine only forces acting on a Rectangular water tank for following data : Height of tank is 6 meter, Capacity of tank 4000 cum meter, grade of concrete and steel is M20 and Fe 250. Take axial and compressible stress in concrete as 2 MPa and 7 MPa. Use IS code 456. **[5]**

b) Explain type of shells and plate structure. **[5]**



Total No. of Questions :8]

SEAT No. :

P3342

[4660]-1066

[Total No. of Pages :2

M.E. (Civil) (Water Resource & Environmental Engineering)

HYDROLOGY

(2013 Credit Pattern) (Semester - II) (501087)

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) Explain Horton's infiltration capacity curve. Explain experimental method of determining the infiltration capacity of a soil surface in detail. [6]

b) Define Instantaneous Unit hydrograph (IUH) and state limitations of it. [4]

Q2) a) The observed annual peak flood of a river in m³/s for period of 20 years from 1961 to 1980 are given below [6]

190, 155, 298, 136, 137, 131, 140, 124, 185, 104,

91, 154, 109, 269, 164, 270, 142, 72, 130, 111

Calculate the mean, standard deviation and skewness coefficient for this sample.

b) Write a short note on chi squared test. [4]

Q3) a) Explain Log Pearson Type 3 Distribution (LP3). [6]

b) Define clearly Design flood and Probable Maximum Flood. [4]

Q4) a) Explain Modified Pul's Method of Flood Routing. [6]

b) Explain Schematic representation of inflow, outflow, and storage in a uniformly progressive wave. [4]

P.T.O.

- Q5) a)** Define the terms: [2]
- i) Aquifuge,
 - ii) Aquiclude,
 - iii) Aquitard
 - iv) Confined aquifer.

- b) A 20 cm diameter well penetrating in a confined aquifer is pumped at a uniform rate of 30 lit/s and the drawdowns measured in an observation well 60 m away are given below [8]

t, hours	0.167	0.0333	0.0666	0.1333	0.5	1.0	2.0	3.0	4.0
s, meters	0.20	0.30	0.41	0.53	0.76	0.90	1.00	1.07	1.12

Determine the aquifer parameters T and S using Theis method and estimate the drawdown in the well at the end of 7 days of pumping.

- Q6) a)** Explain two geo-physical method to explore Ground water. [4]

- b) Explain various types of wells. Explain methods of well construction. [6]

- Q7) a)** Enlist the various methods of artificial recharge of ground water and explain any one in detail. [6]

- b) Explain ground water-Budget Equation. [4]

- Q8) a)** What are the analog models? Explain any two models. [6]

- b) Explain in short Porous Media ground water models. [4]

EEE

Total No. of Questions : 8]

SEAT No. :

P2983

[Total No. of Pages : 2

[4660] - 1067

M.E. (Civil) (Water Resources and Environmental Engineering)

OPEN CHANNEL HYDRAULICS

(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 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) Explain the characteristics of M2 profile and state one example of its occurrence. **[4]**

Q2) a) Derive Chezy's formula. Also derive relation between Chezy's 'C' and Manning's 'n'. **[5]**

b) Explain method of direct integration for gradually varied profile computation. **[5]**

Q3) a) Classify hydraulic jump using the Froud No. Draw the sketch of each jump and state the energy dissipation possible. **[4]**

b) 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 m³/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. **[6]**

P.T.O.

- Q4)** a) State applications of hydraulic jump. [2]
- 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. [8]
- Q5)** a) Derive De Marchi equation for side weir. [6]
- b) Write short note on solitary wave. [4]
- Q6)** a) Classify the SVF profiles. [4]
- b) Derive dynamic equation of uniformly progressive wave. [6]
- Q7)** a) Write in brief about alluvial channel bed forms. [4]
- b) Discuss the development of Muskingum method of flood routing stating the equations and algorithm. [6]
- Q8)** a) Derive Rouse equation for suspended bed load. [6]
- b) Explain method of characteristics for flood routing. [4]



Total No. of Questions : 8]

SEAT No. :

P3207

[Total No. of Pages : 2

[4660] - 1069

M.E. (Civil) (Water Resources & Environmental Engg.)

ADVANCED WATER & WASTE WATER TREATMENT

(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) *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 methods 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 8000m³/day, BOD of settled effluent = 180 mg/l, expected BOD of treated effluent 10 mg/l, yield coefficient =0.5 kg/kg, K_d = 0.05/day, MLSS =3000 mg/l, return sludge solids concentration = 10,000 mg/l, and mean cell residence time is 10 days. **[10]**

Determine :

- | | |
|-----------------------|----------------------------|
| 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. :

P2985

[Total No. of Pages : 3

[4660] - 1072

M.E.(Mechanical) (Heat Power Engg./ Energy Engg.)
ADVANCED MATHEMATICS AND NUMERICAL METHODS
(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Answer any Five questions out of Eight questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to right indicate full marks.*
- 4) *Use of logarithmic tables, Mollier charts, electronic pocket calculator and steam tables are allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Using False position method, find the root of the equation. **[5]**

$y = x.e^x - \cos(3.x) - 0.51$ carry out four iterations. Assume initial values as 0 & 0.5

b) In a typical experiment, following data is collected. **[5]**

x	1	3	5	7	9
y	1.5	2.8	4	4.7	6

It is expected that y is having parabolic relationship with x. Fit parabolic curve for the above data.

Q2) a) Solve the following set of equations using LU decomposition method. **[5]**

$$54x_1 + x_2 + x_3 = 110$$

$$2x_1 + 15x_2 + 6x_3 = 72$$

$$-x_1 + 6x_2 + 27x_3 = 85$$

b) For the following data calculate value of y at x = 0.4 using Newton Divided Difference Method. **[5]**

x	0.1	0.3	0.6	0.8
y	0.72	1.81	2.73	3.47

P.T.O.

- Q3) a)** The following data describes variation of a certain flow parameter with respect to time. [5]

Time (in hrs)	1	2	3	4
Flow parameter	1	4	9	16

Find the value of flow parameter given in the problem at the end of 3.5 hrs using cubic spline interpolation.

- b) Using Romberg integration technique, Find improved estimate of integral of e^{-x^2} between the limits of $a = 0.2, b = 1.5$. [5]

- Q4) a)** Evaluate $\int_1^{2.6} \int_2^{3.2} \frac{1}{x+y} dx dy$, using Gauss quadrature two point formula. [5]

- b) Determine the largest eigen value and corresponding eigen vector of the matrix. [5]

$$\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

- Q5) a)** Using given's method, reduce the following matrix to the tri-diagonal form. [5]

$$A: \begin{bmatrix} 2 & 1 & 3 \\ 1 & 4 & 2 \\ 3 & 2 & 3 \end{bmatrix}$$

- b) Apply Runge - kutta method of fourth order to find approximate value of y for $x = 0.2$ in steps 0.1 if $\frac{dy}{dx} = x + y^2$, given that $y = 1$ when $x = 0$. [5]

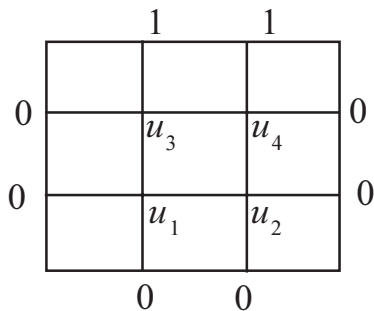
- Q6) a)** Use Adam's Bash forth method to find $y(0.4)$ given that [5]

$$\frac{dy}{dx} = 1 + xy, \quad y(0) = 0.2, \quad y(0.1) = 2.1103$$

$$y(0.2) = 2.243, \quad y(0.3) = 2.4011$$

- b) Solve the partial differential equation. [5]

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0 \text{ for figure given below.}$$



Using Jacobi's method.

Q7) a) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the conditions **[5]**

$u(x,0) = \sin \pi x; \quad 0 \leq x \leq 1 \quad u(0,t) = u(1,t) = 0$, using Crank - Nicolson method. Carry out computations for two levels, taking $h = \frac{1}{3}, \quad k = \frac{1}{36}$

b) Solve by Gauss - Seidel Method, the following system of equations. **[5]**

$$20x + y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25$$

Q8) a) Using the shooting method, Solve the boundary value problem $y''(x) = y(x), \quad y(0) = 0 \text{ and } y(1) = 1.17$ **[5]**

b) Solve the Poisson equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = 0 = y, \quad x = y = 3$, with $u = 0$ on the boundary and mesh length of unity. **[5]**



Total No. of Questions : 7]

SEAT No. :

P2986

[Total No. of Pages : 2

[4660] - 1074

M.E. (Mechanical - Heat Power)
ADVANCED FLUID MECHANICS
(2013 Pattern) (Semester - I)

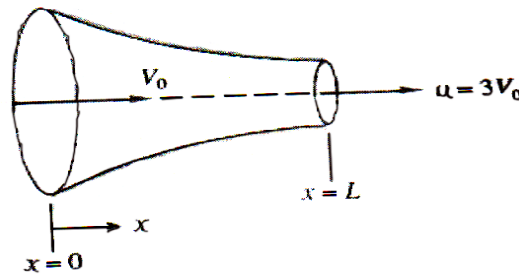
Time : 3 Hours]

[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) Derive an expression, $\rho \frac{D\bar{V}}{Dt} = \bar{f}$ for conservation of momentum using differential analysis. [5]
- b) Assume that flow in the converging nozzle of Fig. has the form $\bar{V} = V_0 [1 + (2x)/L]\bar{i}$. [5]
Compute
- a) the fluid acceleration at $x = L$ and
 - b) the time required for a fluid particle to travel from $x = 0$ to $x = L$.



- Q2)** a) Derive Bernoulli's equation of motion using Navier Stokes equation. [5]
- b) Consider the steady two dimensional, incompressible, inviscid velocity field, $\bar{V} = (ax + b)\bar{i} + (-ay + c)\bar{j}$, where a,b,c are constants. Calculate the pressure as a function of x and y. [5]

- Q3)** An infinite, incompressible fluid is resting on a flat horizontal plate located at $y = 0$ and stretching to infinity in each direction. At time $t = 0$, the plate is given a velocity U_0 . Show that velocity at any point in the fluid at time t is given by

$$u = U_0 \frac{2U_0}{\sqrt{\pi}} \int_0^\eta e^{-\eta^2} d\eta, \text{ where } \eta = \frac{y}{2\sqrt{vt}} \quad [10]$$

P.T.O.

- Q4)** a) Explain the four simple Potential flows with graphical representations. [5]
 b) A 300 mm diameter circular cylinder is rotated about its axis in a stream of water having a uniform velocity of 5 m/s. Estimate the rotational speed when both the stagnation points coincide. Estimate the lift force experienced by the cylinder under such condition. [5]
- Q5)** a) Obtain expression for ordinary differential equation for laminar boundary layer over flat plate. [5]
 b) Air at 30°C flows over a 2 - m-wide, 4 - m - long flat plate with a velocity of 2 m/s and $dp/dx = 0$. At the end of the plate, estimate (a) the wall shear stress, (b) the flow rate through the boundary layer. Assume laminar flow over the entire length. [refer Table] [5]

Table :- The Laminar Boundary - Layer Solution with $dp/dx = 0$

$\eta = y\sqrt{\frac{U_\infty}{\nu x}}$	F	$F' = u / U_\infty$	$\frac{1}{2}(\eta F' - F)$	F''
0	0	0	0	0.3321
1	0.1656	0.3298	0.0821	0.3230
2	0.6500	0.6298	0.3005	0.2668
3	1.397	0.8461	0.5708	0.1614
4	2.306	0.9555	0.7581	0.0642
5	3.283	0.9916	0.8379	0.0159
6	4.280	0.9990	0.8572	0.0024
7	5.279	0.9999	0.8604	0.0002
8	6.279	1.000	0.8605	0.0000

- Q6)** a) Derive an expression of boundary layer thickness in a turbulent flow on flat plate using momentum integral equation. [5]
 b) Derive an expression for Navier Stokes equation for turbulent flow. [5]
- Q7)** a) Develop area- velocity relationship in terms of Mach number and discuss effect of variation of area for subsonic, sonic and supersonic flows. [5]
 b) A normal shock wave takes place during the flow of air at a Mach number of 1.8. The static pressure and temperature of the air upstream of the shock wave are 100 kPa(abs) and 15°C. Determine the Mach number, pressure and temperature downstream of the shock. [5]



Total No. of Questions :7]

SEAT No. :

P3395

[4660]-1077

[Total No. of Pages :3

M.E. (Mech.) (Heat Power)
ADVANCED HEAT TRANSFER
(2013 Credit Pattern) (Semester - II) (502107)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Answer any five questions out of 7.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Use of steam tables, and scientific calculator is allowed.*
- 4) *Assume suitable data wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) a) A metal piece of length 60 cm has a cross section corresponding to a sector of a circle of radius 10 cm and included angle 60°C. Its ends are maintained at temperature of 125°C and 25°C, and the thermal conductivity of the material has a linear variation with temperature in degree celsius.

$$K = (100 - 0.01 t) \text{ W / m-deg}$$

Find the heat flow rate through the metallic piece. Presume uni-directional heat conduction, i.e., neglect any variation of temperature in the θ and r-directions. **[6]**

b) Find the thermal diffusivity of water and air. Thermal conductivities of water and air as 55×10^{-5} kW/mK and 0.026 J/smK. **[4]**

Q2) a) A die cast component has a mass of 1.25kg and density 7250 kg/m³ with surface area of 0.08 m². The component is heated to a temperature of 350°C and is exposed to air at 25°C with convective heat transfer coefficient of 60 W/m²K. Calculate: **[6]**

- i) Temperature of the component after 5 minutes,
- ii) Time constant,
- iii) Value of convective heat transfer coefficient upto which lumped parameter analysis is valid.

For the material of the component take, thermal conductivity = 100 W/mK and specific heat = 400 J/kgK.

b) Explain transient heat transfer and thermal contact resistance. **[4]**

P.T.O.

Q3) a) Explain: [6]

i) Velocity and thermal boundary layer.

ii) Reynold's analogy.

b) Define: [4]

i) Biot Number,

ii) Nusselt Number,

iii) Reynold's Number and

iv) Grashoff's Number.

Q4) a) In a certain pharmaceutical process, castor oil at 35°C flows over a flat at 6 cm/s. The plate is 6m long, is heated uniformly and maintained at a surface temperature of 95°C. Make calculations for the [7]

i) hydrodynamic and thermal boundary layer thickness at the trailing edge of the plate,

ii) total drag per unit width on one side of the plate,

iii) total heat transfer from one side of the plate per unit width.

Assume the following properties: $\alpha = 7.2 \times 10^{-3} \text{ m}^2/\text{s}$, $k = 0.21 \text{ W/mK}$, $\nu = 0.65 \times 10^{-4} \text{ m}^2/\text{s}$, $\rho = 956.8 \text{ kg/m}^3$.

b) Explain in brief laminar and turbulent flow in tubes. [3]

Q5) a) Airflow through a long rectangular heating duct that is 0.75m wide and 0.3 m high maintains the outer duct surface at 45°C. If the duct is uninsulated and exposed to air at 15°C in the crawlspace beneath a home, what is the heat loss from the duct per meter of length? [7]

Properties of air $\alpha = 22.9 \times 10^{-6} \text{ m}^2/\text{s}$,

$k = 0.026 \text{ W/mK}$, $\nu = 16.2 \times 10^{-6} \text{ m}^2/\text{s}$, $\text{Pr} = 0.71$

Use relation:
$$\overline{\text{Nu}}_L = 0.68 + \frac{0.670 \text{ Ra}_L^{1/4}}{[1 + (0.492 / \text{Pr})^{9/16}]^{4/9}}$$

b) Explain combined natural and forced convection. [3]

Q6) a) A vertical tube of 50mm OD and 2m long is exposed to steam at atmospheric pressure. The outer surface of the tube is maintained at a temperature of 84°C by circulating cold water through the tube. Determine the rate of heat transfer and condensate mass flow rate. The properties of saturated vapour at 100°C are (Saturation temperature). [7]

$$h_{fg} = 2257 \text{ kJ/kg.}$$

$$\rho_v = 0.596 \text{ kg/m}^3$$

The properties of saturated liquid at mean film temperature are

$$\rho_l = 963.4 \text{ kg/m}^3$$

$$\mu_l = 306 \times 10^{-6} \text{ Ns/m}^2$$

$$K_l = 0.677 \text{ W/mK}$$

b) For the parallel flow of a fluid over a heated flat plate assuming laminar boundary layer over the entire length, sketch the profile of velocity boundary layer and thermal boundary layer for Prandtl no. Values of [3]

i) $Pr = 1.0$ ii) $Pr \ll 1.0$ iii) $Pr \gg 1.0$

Q7) a) State and explain Planck's Law and hence derive Wein's Law. Assuming the sun to be a black body emitting radiation with maximum intensity at $\lambda = 0.49 \mu\text{m}$, calculate the surface temperature of the Sun and heat flux at the surface of the Sun. [7]

b) Find the shape factor of a hemispherical cavity with respect to itself. [3]

EEE

Total No. of Questions : 7]

SEAT No. :

P3209

[Total No. of Pages : 3

[4660] - 1078

M.E. (Mechanical - Heat Power Engg.) (Part - II)

AIR CONDITIONING TECHNOLOGY

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer 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) A laboratory has the following heat gains : **[10]**

Sensible heat = 35 kW, Latent heat = 20 kW

The design conditions are as follows:

Outside: 40 °C DBT and 27 °C WBT

Inside: 22 °C DBT and 50 % RH

The ventilation air requirement is 80 cmm. A cooling coil with a bypass factor of 0.05 must be used. An apparatus dew point of 10 °C must be maintained. Determine :

- a) Amount of reheat required,
- b) Supply air quantity,
- c) DBT and WBT of air entering and leaving the apparatus,
- d) Supply air temperature.

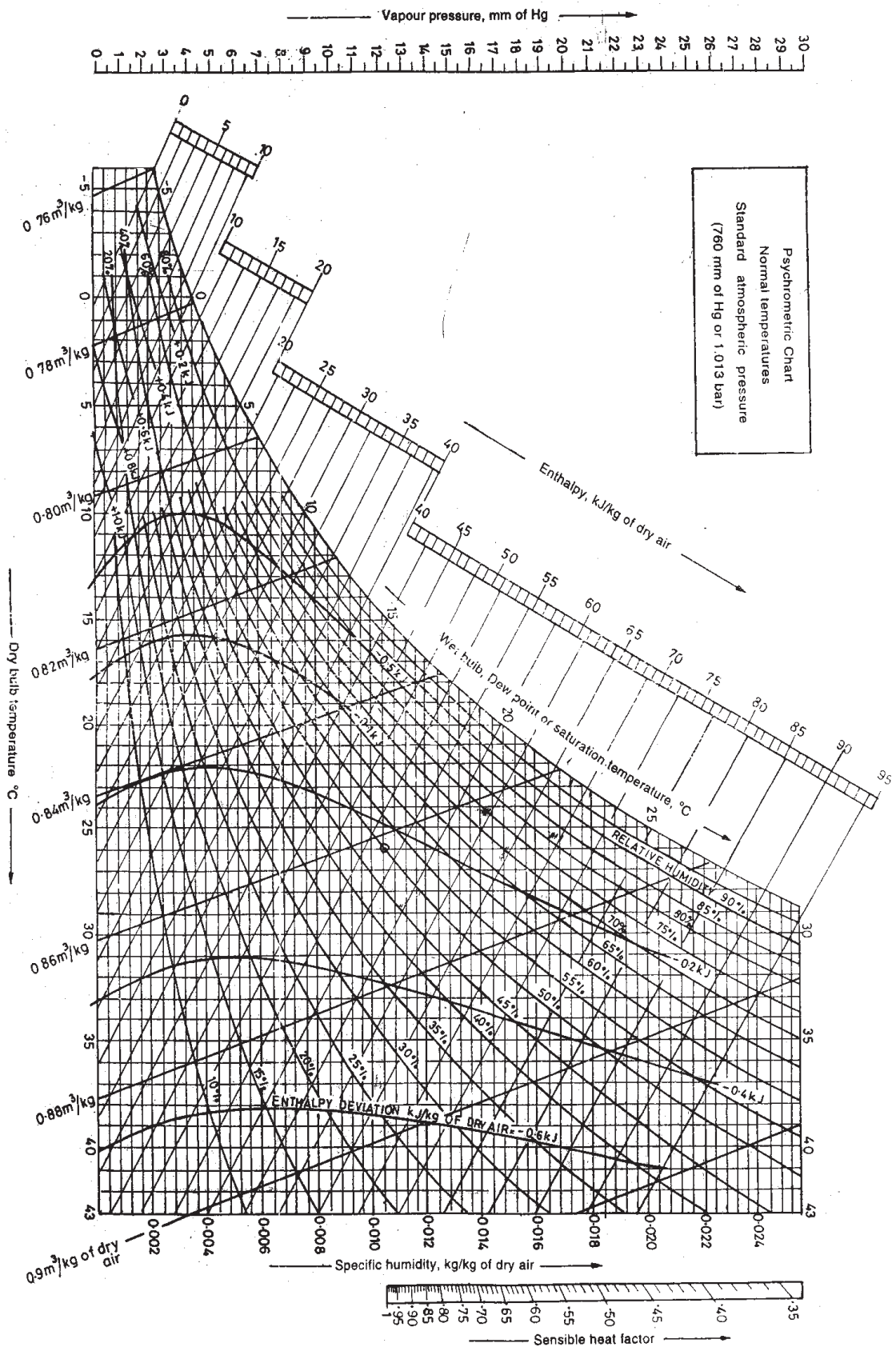
Q2) An air conditioned room that stands on a well-ventilated basement measures 3 m wide, 3 m high and 6 m deep. One of the two 3 m walls faces west and contains a double glazed glass window of size 1.5 m x 1.5 m, mounted flush with the wall with no external shading. There are no heat gains through the walls other than the one facing west. Calculate the sensible, latent and total heat gains on the room, room sensible heat factor from the following information. What is the required cooling capacity? **[10]**

Inside conditions: 25 °C DBT, 50 % RH

P.T.O.

Outside conditions: 43 °C DBT, 24 °C WBT
U-value for wall : 1.78 W/m²K
U-value for roof: 1.316 W/m²K
U-value for floor: 1.2 W/m²K
Effective Temp. Difference (ETD) for wall: 25°C
Effective Temp. Difference (ETD) for roof: 30°C
U-value for glass : 3.12 W/m²K
Solar Heat Gain (SHG) of glass: 300 W/m²
Internal Shading Coefficient (SC) of glass: 0.86
Occupancy : 4 (90 W sensible heat/person)(40 W latent heat/person)
Lighting load: 33 W/m² of floor area
Appliance load: 600 W (Sensible) + 300 W(latent)
Infiltration : 0.5 Air Changes per Hour
Barometric pressure : 101 kPa

- Q3)** Explain the following points : **[10]**
Effective Temperature, PMV, PPD, ASHRAE Comfort chart and Infiltration
- Q4)** Compare: **[10]**
a) Solid desiccant Vs Liquid desiccant dehumidification.
b) Single stage Vs Two stage evaporative cooling.
- Q5)** a) Explain with a suitable example Static Regain Method of duct design.
List its advantages and disadvantages. **[6]**
b) Write a note on Selection and location of supply and return grills,
diffusers. **[4]**
- Q6)** Explain Closed loop and open loop control system for air conditioning
application. **[10]**
- Q7)** The room air leaves an air conditioned space at 25 °C, 50 % RH. The
bypass factor of the cooling coil is zero. The outdoor air is at 45 °C and
30 % RH. The outdoor air quantity is 100 cmm. RSH and RLH are 200
kW and 50 kW respectively. Determine the supply air state, mass flow rate
of supply air, state at inlet to cooling coil, Ventilation load in TR and Total
cooling load. **[10]**



Total No. of Questions : 8]

SEAT No. :

P3343

[Total No. of Pages : 3

[4660] - 1079

M.E (Mechanical) (Heat Power Engineering)
MEASUREMENTS AND CONTROLS
(2013 Credit Pattern) (Semester-II) (502109)

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 what is meant by:

- i) Active instruments.
- ii) Passive instruments.

Give examples of each and discuss the relative merits of these two classes of instruments. [5]

b) Write down the general differential equation describing the dynamic response of a second order measuring instrument and state the expressions relating the static sensitivity, undamped natural frequency and damping ratio to the parameters in this differential equation. [5]

Q2) a) Instruments are normally calibrated and their characteristics defined for particular standard ambient conditions. What procedures are normally taken to avoid measurement errors when using instruments that are subjected to changing ambient conditions? [5]

b) In a survey of 15 owners of a certain model of car, the following figures for average petrol consumption were reported. [5]

25.5	30.3	31.1	29.6	32.4	39.4	28.9	30.0	33.3	31.4	29.5	30.5	31.7	33.0	29.2
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

Calculate the mean value, the median value and the standard deviation of the data set.

P.T.O.

Q3) a) Describe the functioning of a stroboscope and describe how speed of rotating shaft can be measured using a single pattern and multi pattern disc. [6]

b) An automobile fender vibrates at a frequency of 16 Hz with peak amplitude of 5 mm. Calculate the value of peak acceleration. [4]

Q4) a) Describe the method of measuring torque of rotating shaft using strain gauges. [5]

b) Find the length of the beam of an analytical balance with a sensitivity of 5000 rad/kg. The fulcrum is 1mm above the centre of gravity of the beam and the maximum prescribed weight of the beam is 100 gm. [5]

Q5) a) Classify the methods for level measurements into direct and inferential methods giving suitable examples. [5]

b) A thermistors has a resistance of 3980Ω at the ice point and 794Ω at 50°C . The resistance-temperature relationship is given by $R_T = a R_o \exp(b/T)$. Calculate the constants a & b. Calculate the range of resistance to be measured in case the temperature varies 40°C to 100°C . [5]

Q6) a) From the data given below find: [6]

i) The two regression equations.

ii) The coefficient of correlation between the marks in Economics and Statistics.

iii) The most likely marks in statistics when marks in economics are 30.

Marks in Economics :	25	28	35	32	31	36	29	38	34	32
Marks in Statistics :	43	46	49	41	36	32	31	30	33	39

b) Explain the difference between systematic and random errors. What are the typical sources of these two types of error? [4]

- Q7)** a) Explain why true mass flow meters are rarely used in industrial applications. Describe the effect of temperature and pressure on viscosity, density and compressibility of fluids. [5]
- b) Explain how resistive transducers can be used for measurement and control of relative humidity. Describe its advantages and limitations. [5]
- Q8)** a) Define proportional plus derivative controller along with mathematical equation. Explain the advantages of adding D control to proportional controller. [5]
- b) Explain PID hydraulic controller. [5]



Total No. of Questions : 7]

SEAT No. :

P3404

[Total No. of Pages : 4

[4660] - 1081

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

COMPUTATIONAL FLUID DYNAMICS

(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) *Use of scientific calculator is allowed.*
- 4) *Assume suitable data, if necessary and mention it clearly.*

Q1) a) Explain and derive the Reynolds Transport equation. Obtain the conservative form of continuity equation in integral form by simplifying Reynolds Transport equation. Explain each term in detail. **[5]**

b) Classify the following system of equations : **[5]**

$$a_1 \frac{\partial u}{\partial x} + a_2 \frac{\partial v}{\partial y} = g_1$$

$$b_1 \frac{\partial v}{\partial x} + b_2 \frac{\partial u}{\partial y} = g_2$$

Consider three cases where,

- i) $a_1 = b_1 = a_2 = b_2 = 1$
- ii) $a_1 = b_2 = 1, b_1 = 0, a_2 = -1$
- iii) $a_1 = b_1 = b_2 = 1, a_2 = -1$

P.T.O.

- Q2) a)** Consider the problem of steady heat conduction in a large plate with uniform heat generation. The faces A and B, as shown in Figure 1, are maintained at constant temperatures. The governing equation is of the generic form given by $\frac{d}{dx}\left(k \frac{dT}{dx}\right) + q = 0$ where, k is the thermal conductivity of the material. For a given thickness $L = 2$ cm with constant thermal conductivity $k = 5$ W/m²K, determine the steady-state distribution in the plate. Temperatures at T_A and T_B are, respectively, 100°C and 400°C, and heat generation q is 500 kW/m³. Divide the domain in four control volumes. **[5]**

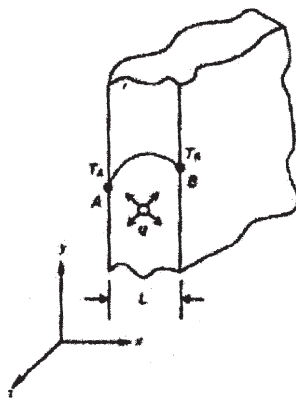


Figure 1 : Schematic of a plate with heat generation

- b) In what type of situation can you simplify the general two-dimensional energy equation : **[5]**

$$\frac{\partial T}{\partial t} + u \frac{\partial T}{\partial x} + v \frac{\partial T}{\partial y} = \frac{k}{\rho C_p} \frac{\partial^2 T}{\partial x^2} + \frac{k}{\rho C_p} \frac{\partial^2 T}{\partial y^2}$$

to reach the well-known Laplace's equations :

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0.$$

Q3) a) What is stability of a numerical scheme? Explain stability criteria for any numerical scheme. [5]

b) What is grid transformation? Why it is necessary? Derive and explain general transformation equations [5]

$\frac{\partial}{\partial x}$, $\frac{\partial T}{\partial y}$ & $\frac{\partial T}{\partial t}$ for two dimensional flow. Use intrinsic co-ordinate system at ξ , η and τ corresponding to x, y and t .

Q4) Write Euler's equation and explain each term. Discretize following equations using : [10]

a) Upwind scheme

b) Lax-wendroff scheme and

c) MacCormack scheme

$$\frac{\partial u}{\partial t} + c \frac{\partial u}{\partial x} = 0$$

$$\frac{\partial u}{\partial t} + u \frac{\partial u}{\partial x} = 0$$

Q5) a) Explain use of Simple algorithm for solution of Navier Stokes equations in two dimensional flows. [5]

b) Write in detail complete two dimensional Navier Stokes equations in differential form, in terms of velocity components, pressure, body force and shear stress terms. Write 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) Convert two dimensional Laminar X-momentum equation into turbulent flow equation. Explain different terms like temporal mean velocity fluctuating component and instantaneous velocity component. [5]
- b) Explain turbulence intensity or degree of turbulence or level of turbulence. What is isotropic flow? Write intensity for isotropic flow. [5]
- Q7)** a) What is turbulence modeling? Classify turbulence modeling. Explain $k - \epsilon$ turbulent model giving its advantage and disadvantage. [5]
- b) Derive momentum equation in differential form. [5]



Total No. of Questions : 4]

SEAT No. :

P3344

[4660]-1082

[Total No. of Pages : 2

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

DESIGN OF HEAT TRANSFER EQUIPMENTS

(602114) (2013 Credit Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Question No. 1 is compulsory and attempt any two questions from remaining Questions 2, 3, 4.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of Calculator, heat transfer data book, steam table is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) The condenser of a large steam power plant is a heat exchanger in which steam is condensed to liquid water. Assume the condenser to be a *shell-and-tube* heat exchanger consisting of a single shell and 30,000 tubes, each executing two passes. The tubes are of thin wall construction with $D = 25\text{mm}$, and steam condenses on their outer surface with an associated convection coefficient of $h_o = 11,000 \text{ W/m}^2\text{K}$. The heat transfer rate that must be effected by the exchanger is $q = 2 \times 10^9 \text{ W}$, and this is accomplished by passing cooling water through the tubes at a rate of $3 \times 10^4 \text{ kg/s}$ (the flow rate per tube is therefore 1 kg/s). The water enters at 20°C , while the steam condenses at 50°C . What is the temperature of the cooling water emerging from the condenser? What is the required tube length **[18]**

L, per pass? Use NTU method.

Water properties-

$$\rho = 997 \text{ Kg/m}^3$$

$$C_p = 4179 \text{ J/Kg.K}$$

$$\mu = 855 \times 10^{-6} \text{ N.s/m}^2$$

$$k = 0.613 \text{ W/m.K}$$

$$\text{Pr} = 5.83.$$

P.T.O.

Q2) Consider a concentric tube heat exchanger characterized by a uniform overall heat transfer coefficient and operating under the following conditions: [16]

Mass of cold and hot fluid flowing is same as 0.125 Kg/s

Specific heat of cold and hot fluid is 4200 and 2100 J/Kg. K respectively.

Inlet temperature of cold and hot fluid is 40°C and 210°C respectively.

Outlet temperature of cold fluid is 95 °C.

- a) What is the maximum possible heat transfer rate?
- b) What is the heat exchanger effectiveness?
- c) Should the heat exchanger be operated in parallel flow or in counterflow?
- d) What is the ratio of the required areas for these two flow conditions?

Q3) [16]

- a) What are the materials of construction for cooling tower?
- b) Write note on selection criterion for:
 - i) number of tube in HEX,
 - ii) number of passes (tube side),
 - iii) tube thickness.
- c) Compare the NTU and MTD Methods of HEX design.
- d) Draw sketch of Single-pass divided-flow (TEMA J) exchanger with shell fluid mixed and show idealized shell and tube fluid temperature distributions.

Q4) [16]

- a) Write note on effect of fin density on fouling.
- b) What is Thermal Interface material? State its properties. Give examples.
- c) The distribution of burners within a furnace has a significant impact on how heat will be transferred - Justify the statement.
- d) Draw the sketch showing at least ten Common tube-side multi-pass arrangements in shell-and-tube exchangers.



Total No. of Questions : 8]

SEAT No. :

P2987

[Total No. of Pages : 3

[4660] - 1084

M.E.(Design Engineering / Automotive Engineering)

ADVANCED MATHEMATICS

(2013 Pattern) (Semester - I)

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 logarithmic tables, electronic pocket calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Apply Gram - Schmidt method to the given vectors to get an orthonormal basis : (1, 1, 1), (2, 1, 0) and (-1, -1, 1). **[5]**

b) If $w = \phi + i\psi$ represents the complex potential for an electric field and $\phi = 3x^2 - 3y^2 + 2y$ determine the function ψ . **[5]**

Q2) a) Evaluate the following integral, where C is the closed curve $|z| = 2.5$.

$$\oint_C \frac{z^2 dz}{(z+2)(z-1)^2} \quad \mathbf{[6]}$$

b) A particle moves along a path so that its displacement x from a fixed point O, at time t , is given by $\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^{-2t}$. If at time $t = 0$, the particle is at rest at $x = 0$, find by Laplace Transform, the displacement at any time $t > 0$. **[4]**

Q3) a) Define a periodic function and find the Laplace Transform of $f(t) = t, 0 < t < \pi$

$$= \pi - t, \pi < t < 2\pi$$

where $f(t) = f(t + 2\pi)$ **[4]**

P.T.O.

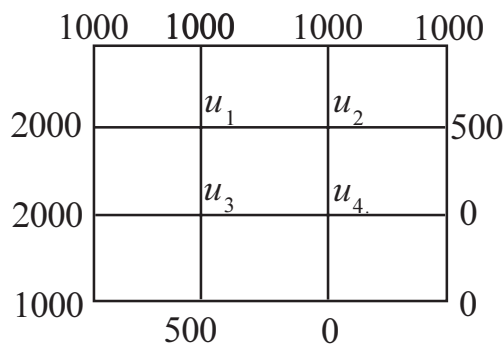
b) Solve the differential equation using power series solution.

$$(1+x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = 0. \quad [6]$$

Q4) a) Determine the largest eigen value and the corresponding eigen vector of

the matrix $\begin{pmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{pmatrix}$ taking $X_0 = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$. [5]

b) Evaluate the function $u(x, y)$ satisfying $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the lattice points, given the boundary values as follows : [5]



Q5) a) Given $\frac{\partial u}{\partial t} = 25 \frac{\partial^2 u}{\partial x^2}$ and [5]

$$u(0, t) = 0 = u(10, t)$$

$$u(x, 0) = \frac{1}{25} x(10 - x)$$

Choosing $h = 1$, k suitably find U_{ij} for

$$0 \leq i \leq 9 \quad i \leq j \leq 4$$

b) Using Galerkin's method, solve the boundary value problem

$$\frac{d^2y}{dx^2} = 3x + 4y; \quad y(0) = 0, \quad y(1) = 1 \quad \text{taking } \phi(x) = x(2-x) \quad [5]$$

Q6) a) Find the curves on which the functional $\int_0^1 [(y')^2 + 12xy] dx$ with $y(0) = 0$ and $y(1) = 1$ can be extremized. [5]

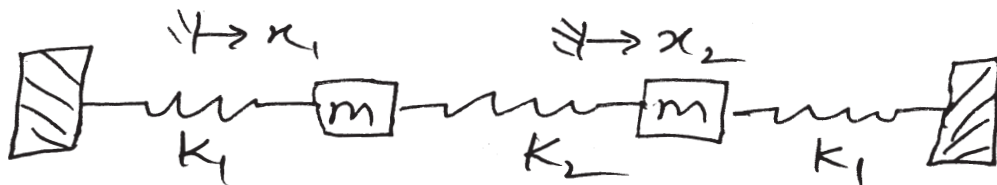
b) Find the path followed by a particle given by $y = \alpha + \beta x$ of Least square line that best fit for the data of points of the particle follows (1, 2), (-1, 1) and (2, 3). [5]

Q7) a) Show that under the transformation $w = \frac{i-z}{i+z}$, x axis in Z - plane is mapped onto the circle $|w| = 1$. [5]

b) Find the Fourier transformation of $f(x) = \begin{cases} 1 - x^2 & |x| \leq 1 \\ 0 & |x| > 1 \end{cases}$ [5]

and hence evaluate $\int_0^\infty \left(\frac{x \cos x - \sin x}{x^3} \right) \cos \frac{x}{2} dx$.

Q8) a) For the system shown in the figure below if $m = 1, k_1 = 1, k_2 = 1$, assuming there is no friction. Find natural frequencies of the system and corresponding normal modes of vibration using matrix method. [5]



b) Solve the boundary value problem $U_{tt} = 25 U_{xx}$ with the boundary conditions [5]

$u(0,t) = u(5,t) = 0$ and initial conditions $u(x,0) = \begin{cases} 20x & 0 \leq x \leq 1 \\ 5(5-x) & 1 \leq x \leq 5 \end{cases}$ and

$u_t(x,0) = 0$ by taking $h = l$ upto $t = l$.



Total No. of Questions : 7]

SEAT No. :

P2988

[Total No. of Pages : 2

[4660] - 1086

M.E.(Mechanical Design Engineering) (Semester - I)

ADVANCED STRESS ANALYSIS

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) Attempt any five questions.
- 2) Neat diagram should be drawn wherever necessary.
- 3) Assume suitable data if, required, but state the assumptions clearly.
- 4) Figures to the right indicate full marks.
- 5) Use of calculator is allowed.

Q1) Derive an equilibrium equation in polar coordinate system. [10]

Q2) Explain different criterion of stress analysis for plasticity. [10]

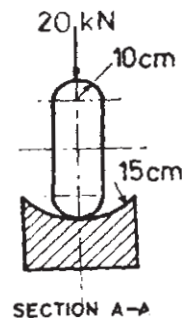
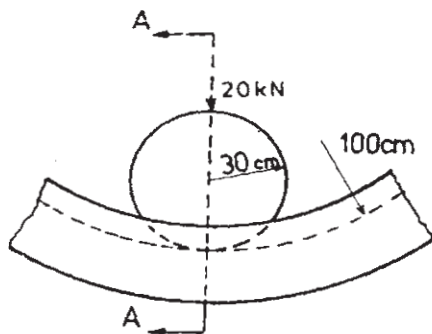
Q3) a) Investigate validity of the stress function. [6]

$$\phi = \left[Axy + B \frac{xy^3}{6} \right] \text{ Also determine stresses.}$$

b) Explain sliding friction consideration in contact stress analysis. [4]

Q4) Obtain a deflection of circular plate subjected due to symmetrical loading with respect to center. [10]

Q5) A hardened steel roller ($E = 210 \text{ GPa}$ and $\nu = 0.29$) runs in an annular groove of cast iron member ($E = 110 \text{ GPa}$ and $\nu = 0.26$) with total load of 20 kN. Determine the maximum principal stress, maximum shear stress and locate the point where these stress occur. [10]



P.T.O.

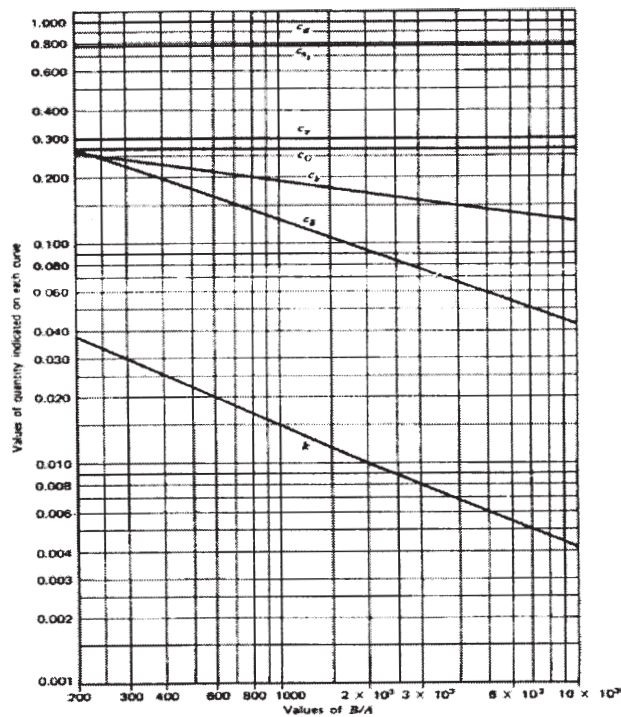
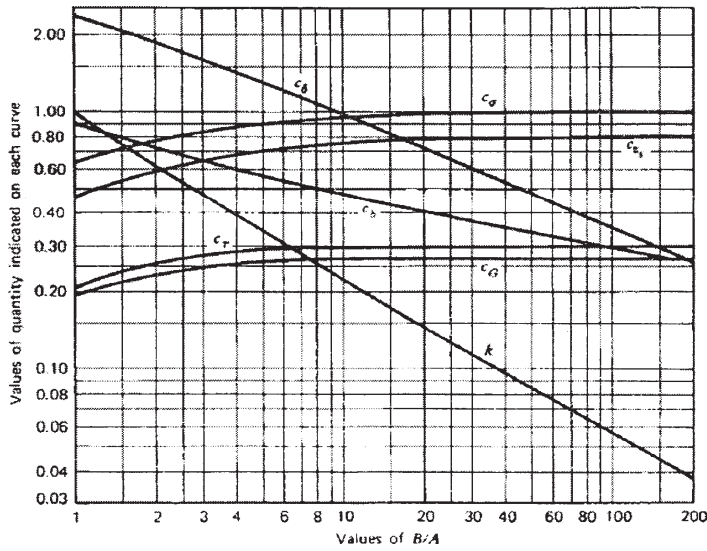
Q6) Write short note on (any two)

[10]

- a) Isochromatic Fringe Analysis.
- b) Strain Gauge Rosette.
- c) Dimensional Analysis in Experimental Technique.

Q7) a) Derive the expression for Modulus of elasticity for composite considering iso-stress & iso-strain condition. [5]

b) Explain different types of engineering plastics with suitable examples. [5]



[4660] - 1089

M.E. (Mech.) (Design Engineering) (Semester - II)
ANALYSIS AND SYNTHESIS OF MECHANISMS
(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) Explain the term 'Mobility of a mechanism'. Find the mobility of the linkages shown in Fig. 1 (a). Based on this, state whether the linkages shown are mechanisms with 1 DOF. If not, make suitable changes. The number of links should not be varied by more than 1. [5]

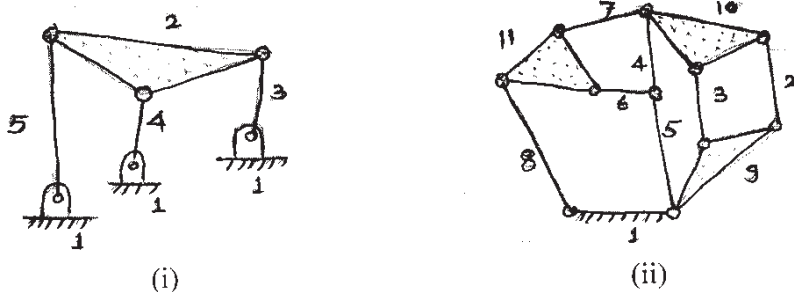


Fig.1(a)

- b) Explain the term 'Kinematically complex' mechanism. Discuss the terms with suitable examples : [5]
- i) low degree of complexity &
 - ii) high degree of complexity.

In the mechanism shown in the Fig. 1 (b) below, $\omega_2 = 10$ rad/sec (CW) (constant). Determine ω_6 & α_6 . (Use method of Normal Accelerations.)
 Given: $O_2A = 7.5$ cm, $AB = 5$ cm, $BC = 7.5$ cm, $O_5C = 6.25$ cm (and is vertical), $CD = 10$ cm, $BD = 5$ cm, $O_6D = 5$ cm, Angle $O_2AB = 110^\circ$, Angle $ABC = 115^\circ$, Angle $O_6DB = 117^\circ$.

P.T.O.

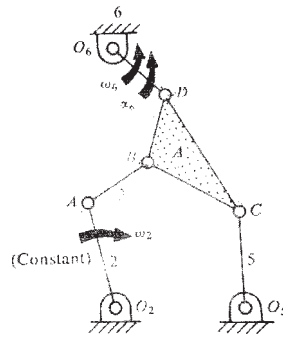


Fig.1(b)

- Q2) a) State the 'Principle of Superposition'. Derive the equation of motion of a mechanism based on energy considerations. [5]
- b) What are 'Elastic mechanisms'? Discuss the dynamic analysis of elastic mechanism. [5]
- Q3) a) What is 'Inflection Circle'? Discuss in details the method/construction to locate 'inflection circle'. [5]
- b) Explain in brief following : [5]
- i) Bobilliar Construction
 - ii) Hartmann Construction
 - iii) Forms of Euler - Savary equation
- Q4) a) Define the term 'Cubic of Stationary curvature'. Determine the cubic of stationary curvature for plane motion equivalent to the rolling of a circle along a fixed straight line. [5]
- b) Discuss 3-position graphical synthesis of a 4-bar mechanism for body guidance. Synthesize a 4-bar mechanism to guide a rod AB through the three consecutive positions A_1B_1 , A_2B_2 & A_3B_3 as shown in Fig.4(b) [5]

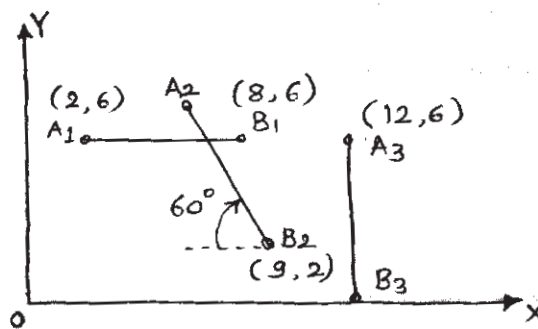


Fig.4(b)

- Q5)** a) Explain with suitable example : **[5]**
- i) Motion generation
 - ii) Function generation
 - iii) Path generation
- b) Discuss the term ‘mechanical error’. Explain the analysis of ‘mechanical error’ & prove that the total mechanical error (ϵ_m) in the linkage is the sum of the individual errors due to each of the parameters considered separately. **[5]**

- Q6)** a) Derive ‘Freudenstein’s equation for planar 4-bar linkage. Explain the algebraic synthesis of slider crank with 4- accuracy points using this equation. **[5]**
- b) Explain the method of algebraic synthesis using complex numbers for 4-bar mechanism with 3- accuracy points. Using this method, determine the link lengths of a 4-bar linkage that will in one of its position satisfy the following specifications of angular velocity & angular acceleration. Length of input link is to be unity. The subscript 1, 2, & 3 represent the input link, the coupler & the output link respectively. Draw the mechanism & comment on the resulting mechanism. (Use Complex number method.) **[5]**

Angular velocity	Angular acceleration
$\omega_1 = 10.00 \text{ rad/sec}$	$\alpha_1 = 0 \text{ rad/sec}^2$
$\omega_2 = 5 \text{ rad/sec}$	$\alpha_2 = 0 \text{ rad/sec}^2$
$\omega_3 = 0 \text{ rad/sec}$	$\alpha_3 = 86.6 \text{ rad/sec}^2$

- Q7)** a) Discuss Denavit-Hartenberg (D-H) parameters with their importance in analysis of spatial mechanisms. Use D-H parameters to write a symbolic equation for the following mechanisms. **[5]**
- i) Planar 4R Mechanism
 - ii) Spherical 4R mechanism
- b) Derive displacement equations for the 4R Spherical mechanism (Hooke’s Joint) using matrix method. **[5]**



[4660]-1090

M.E. (Mechanical) (Design Engineering)
ADVANCED MECHANICAL VIBRATIONS
(502208) (2013 Credit Pattern) (Semester-II)

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 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) Determine natural frequency of the system shown in Fig. 1 by matrix iteration method. [10]

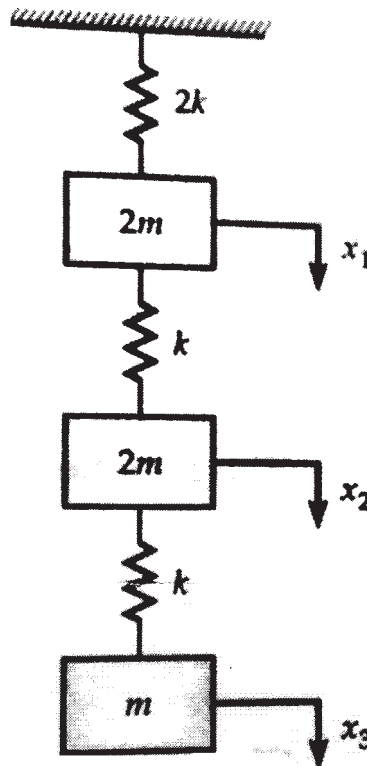


Fig.1

Q2) a) Derive the frequency equation of longitudinal vibrations for a free-free beam with zero initial displacement. [5]

b) Derive the frequency equation and plot the first three eigen functions for the lateral vibration of a string fixed at both ends. [5]

Q3) a) A spring mass system is shown in Fig. 2 which is subjected to a harmonic force $F \cos \omega t$. [6]

Determine the response of the system. Given: $x(0)=0.01\text{m}$, $\dot{x}(0) = 0.04 \text{ m/sec}$, $\omega=30 \text{ rad/sec}$, $F=1000\text{N}$, $m=10 \text{ kg}$, $k=500\text{N/m}$.

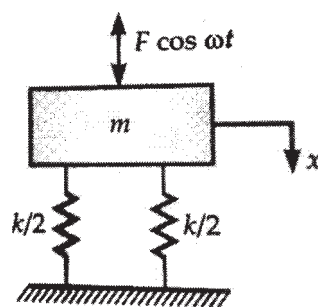


Fig.2

b) What is the maximum acceleration of mass 'm' and spring stiffness 'k' if it is dropped on a hard surface through height 'h'? [4]

Q4) Derive an expression for dimensionless displacements in undamped dynamic vibration absorber in terms of the parameters of the system and explain its working. For tuned absorber show: [10]

a) The relationship between response speed and mass ratio and

b) Frequency response curves for main system and absorber.

Q5) a) Explain how time domain and frequency domain techniques are used for conditions monitoring and fault diagnosis. [5]

b) Explain FFT analyser with a block diagram. [5]

Q6) a) Define and sketch 'Autocorrelation' function. How is it useful in random vibrational analysis. [5]

b) Two random processes are given as [5]

i) $x=A \cos \omega t$

ii) $y=B \cos(\omega t+\phi)$

The phase angle between the two processes is a random variable having uniform probability between 0 to 2π . Calculate correlation between x & y .

Q7) Write note on (Any Four): [10]

a) Rayleigh-Ritz method.

b) Duhamels Integral.

c) In-situ Balancing.

d) Cross-corelation function.

e) Centrifugal Pendulum.



[4660] - 1091
M.E (Mechanical Design)
FINITE ELEMENT METHOD
(2013 Credit Pattern) (502209) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any five questions and carries equal mark 10.*
- 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) What do you mean by FEM? Write its steps, advantages and disadvantages?[10]

Q2) Explain in detail Simpson 1/3 rule? [10]

Q3) Write difference between Implicit and explicit method? [10]

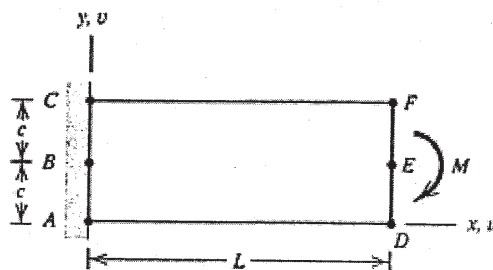
Q4) Explain in detail Jacobi Method? [10]

Q5) Write in detail Modified Newton Raphson Method? [10]

Q6) The cantilever beam shown is tip-loaded by a moment M. Assume that Poisson's ratio is zero. Use beam theory to compute the displacement components of points D, E, and F. Regard these results as nodal displacements, and use them to compute stresses in elements defined as follows. [10]

- a) A CST element whose nodes are A, E, and C.
- b) A CST element whose nodes are B, D, and F.
- c) A Q4 element whose nodes are A, D, F, and C.

Express the stresses in terms of M, L, c and thickness t .



Total No. of Questions : 7]

SEAT No. :

P3348

[Total No. of Pages :2

[4660]-1093

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) *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) How do you define an optimization problem? Give mathematical definition and example. **[5]**

b) Describe the following: **[5]**

- i) Design vector
- ii) Design constraints
- iii) Objective function

Q2) a) Find all basic solutions corresponding to the system of equations given by **[7]**

$$2x_1 + 3x_2 - 2x_3 - 7x_4 = 1$$

$$x_1 + x_2 + x_3 + 3x_4 = 6$$

$$x_1 - x_2 + x_3 + 5x_4 = 4$$

b) What is graphical optimization? What are its limitations? **[3]**

Q3) a) A company plans to make two products tables and chairs from its available resources which consists 400 timber & 450 man hours. It shows that to make a chair required 5 board fit and 10 man hours & yields profit of Rs.45, while each table uses 20 board fit and 15 man hours & has a profit of Rs. 80. How many of each product a manufacturing company should make in order to maximize profit. **[7]**

b) What is convex set and non-convex sets? **[3]**

P.T.O.

Q4) a) Write a note on Golden section method. [5]

b) Explain Powell's method of optimization. [5]

Q5) a) What do you mean by sizing optimization, shape optimization & topology optimization? Explain with examples. [5]

b) Minimize the function [5]

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

using Newton-Raphson method with starting $\lambda_1=0.1$; use $\varepsilon =0.01$

Q6) Write a short note on (Any Three): [10]

- a) Genetic Algorithm.
- b) Neural-network.
- c) Simulated annealing.
- d) Fuzzy optimization.

Q7) a) Write a short note on Bi-directional Evolutionary optimization method. [5]

b) What are the various steps in optimality criteria method for finding the optimal topology of structure with isotopic material? [5]



Total No. of Questions : 8]

SEAT No. :

P3349

[4660]-1094

[Total No. of Pages : 2

M.E. (Mechanical) (Design Engg.)

MECHANICAL MEASUREMENTS & CONTROL

(602214) (2013 Credit 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 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 classification of measuring instruments. **[5]**

b) What are the stages of Measurement system. **[5]**

Q2) a) Compute correlation co-efficient from **[8]**

$$N = 10, \Sigma x = 350, \Sigma y = 310$$

$$\Sigma(x - 35)^2 = 162, \Sigma(y - 31)^2 = 222$$

$$\Sigma(x - 35)(y - 31) = 92$$

b) What are the sources of systematic error. **[2]**

Q3) a) What are the properties of regression co-efficients. **[3]**

b) Find the co-efficient of correlation by Spearman's method for the following data: **[7]**

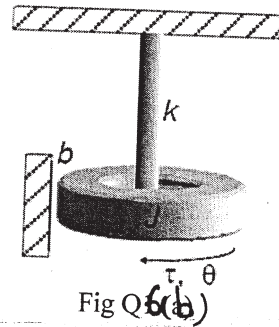
X	45	56	39	54	45	40	56	60	30	36
Y	40	36	30	44	36	32	45	42	20	36

P.T.O.

- Q4)** a) Explain the construction, working of electromagnetic flow meter. [5]
 b) Explain the working of Mc lead gauge for measurement of very low pressure. [5]

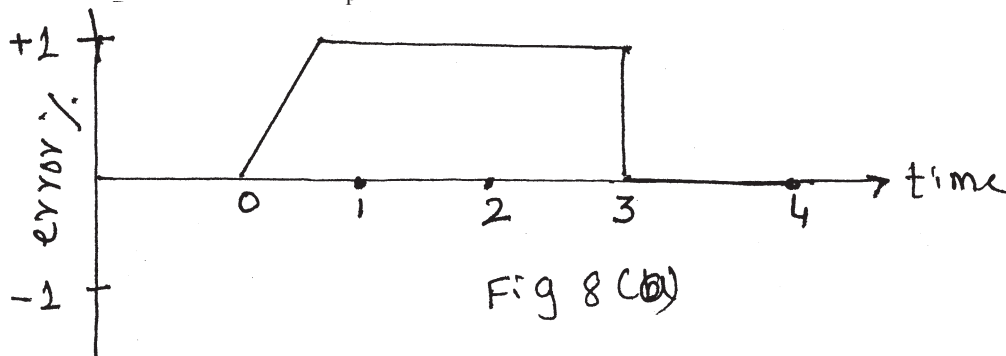
- Q5)** a) What are the various methods of measurement of level. Explain capacitance method. [6]
 b) How do you measure frequency & phase angle measurement. [4]

- Q6)** a) Differentiate between Time Domain and Frequency domain based modelling approach. [5]
 b) A single dof rotational mechanical system is shown in Fig Q1 (a) below. Assuming the states to be angular position θ and angular velocity $\dot{\theta}$, and the output to be angular velocity $\dot{\theta}$, determine the state space model of the system. [5]



- Q7)** a) What are the Transient Response specifications. [2]
 b) Explain proportional + Integral + Derivative control system. [8]

- Q8)** a) Given the error-time fig 8(b), plot a graph of P + I controller output as function of time. $K_p = 5$, $K_I = 1.0S^{-1}$, & $P_1(D) = 20\%$ [7]



- b) Discuss the importance of controllability in a control system. [3]



[4660] - 1096

M.E (Mechanical) (Mechatronics)

SYSTEM MODELLING, IDENTIFICATION & SIMULATION

(2013 Credit 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 indicate full marks.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data, if necessary.
- 6) All questions carry equal marks.

Q1) a) List the advantages and the dis-advantages of the state space modelling approach. [5]

b) Differentiate between Kalman Filter approach and the Extended Kalman Filter approach. [5]

Q2) a) Draw the signal flow diagram for below transfer function. [5]

$$\frac{C(s)}{R(s)} = \frac{(s+3)}{(s^2+10s+24)}$$

b) Using a suitable block diagram explain the process of "Model Identification". [5]

Q3) a) Convert the below state space model into a transfer function. [5]

$$\dot{x} = \begin{bmatrix} -4 & -1.5 \\ 4 & 0 \end{bmatrix} x + \begin{bmatrix} 2 \\ 0 \end{bmatrix} u(t)$$

$$y = [1.5 \quad 0.625]x$$

b) Write the generic state space model of a MDOF system in Diagonal form. [5]

P.T.O.

Q4) a) Draw the flow chart and explain the identification of ARX model using Least Square method. [5]

b) Using a suitable block diagram explain the process of de-fuzzification. [5]

Q5) a) Differentiate between supervised and un-supervised learning. [5]

b) List the criterion for selection of fuzzy membership functions. [5]

Q6) a) Draw the flow chart and explain the working of Predictor-Corrector type Kalman Filter. [5]

b) Draw a flowchart for Least Square based identification of second order systems. [5]

Q7) a) Draw the bond graph for the mechanical system shown in figure Q7 (a). [5]

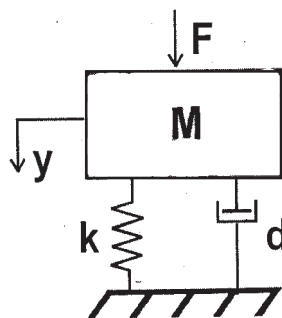


Fig Q 7 (a)

b) Identify a straight line model for below dataset. [5]

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. :

P3213

[4660] - 1098

[Total No. of Pages : 2

M.E. (Mechanical) (Mechatronics)
SENSORS, TRANSDUCERS AND INTERFACING TECHNIQUES
(2013 Credit Pattern) (Semester - I) (502803)

Time :3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any 5 questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat figures, diagrams wherever necessary.*
- 4) *Use of electronic pocket Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Give the significance of uncertainty analysis in primary stages of experiment planning. **[5]**

b) Following measurements of viscosity of certain oil is carried out in laboratory-0.041, 0.040, 0.042, 0.041, 0.039, 0.040, 0.043, 0.042, 0.041, 0.042.

Calculate the mean, variance and standard deviation. **[5]**

Q2) Define Transducer. With the help of neat schematic explain the operation, advantages, disadvantages and applications of following transducers- **[10]**

a) Photoconductive.

b) Hall Effect.

Q3) a) Draw and explain the schematic of knudsen gage. State its advantages, drawbacks and applications. **[5]**

b) Explain Laser Doppler Anemometer (LDA) in detail. **[5]**

Q4) a) What are the different methods of temperature measurement? Explain any one method in detail with their significance, advantage and limitations. **[5]**

P.T.O.

- b) Explain the significance of following terms- [5]
- i) Specific humidity,
 - ii) Dry-bulb temperature
 - iii) Wet-bulb temperature
 - iv) Dew point.
- Q5)** a) Explain the working of strain-gage rosette. [5]
- b) What is Poisson's ratio? Give the significance of it. [5]
- Q6)** a) Draw the generalized block diagram of data acquisition system and explain each block in detail. [5]
- b) State the important parameters of digital to analog convertor and explain any one D/A convertor in detail. [5]
- Q7)** a) Explain any one method for the measurement of strain. [5]
- b) Explain the following terms- [5]
- i) Regression analysis.
 - ii) Level of significance and confidence.



[4660] - 1101
M.E (Mechanical) (Mechatronics)
PLC PROGRAMMING
(2013 Credit Pattern) (Semester - II) (502807)

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) Develop ladder program for the following industrial objective. Given START, STOP, UP and DOWN buttons are push to on momentary switches. LS1 and LS2 are limit switches of NC type. The motor M1 is employed to take the platform up and motor M2 is used to take the platform down. Figure Q1 shows the details. **[10]**

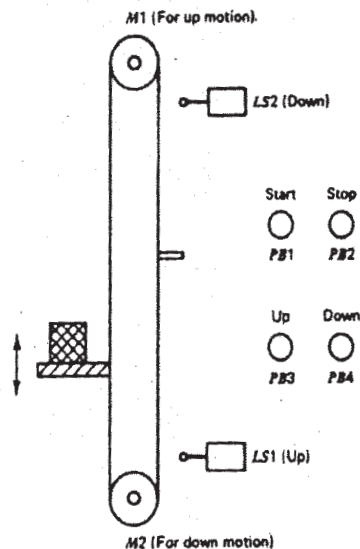


Figure Q1

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

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

Q2) a) Describe with a neat block diagram the Principle of operation of PLC. **[5]**

b) Describe three basic elements of I/O Address. **[5]**

Q3) a) Describe four tasks performed by input module. **[4]**

b) Discuss any three applications of industrial applications of PLC. **[6]**

Q4) a) Compare the method of operation of each of the following types of switches:

i) Manually operated switch.

ii) Mechanically operated switch.

iii) Proximity switch. **[6]**

b) Compare the operation of the reflective-type and through-beam photoelectric sensors. **[4]**

Q5) a) Explain what is meant by a TRUE rung condition and a FALSE rung condition. **[5]**

b) Explain the function of input branching? **[5]**

Q6) Study the ladder logic program in Figure Q6, and answer the questions that follow:

- Suppose the input pushbutton is actuated from off to on and remains held on. How will the status of output B3:0/9 be affected?
- Suppose the input push button is now released to the normally off position and remains off. How will the status of output B3:0/9 be affected? [10]

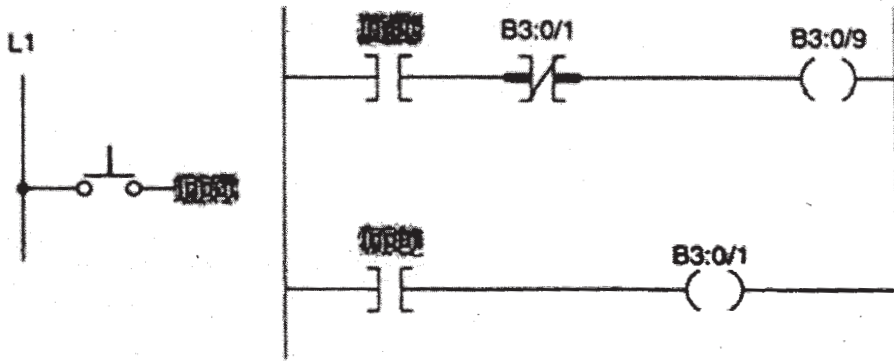


Figure Q6

Q7) Design a PLC program and prepare a typical I/O connection diagram and ladder logic program that will correctly execute the hardwired control circuit shown in Figure Q7. [10]

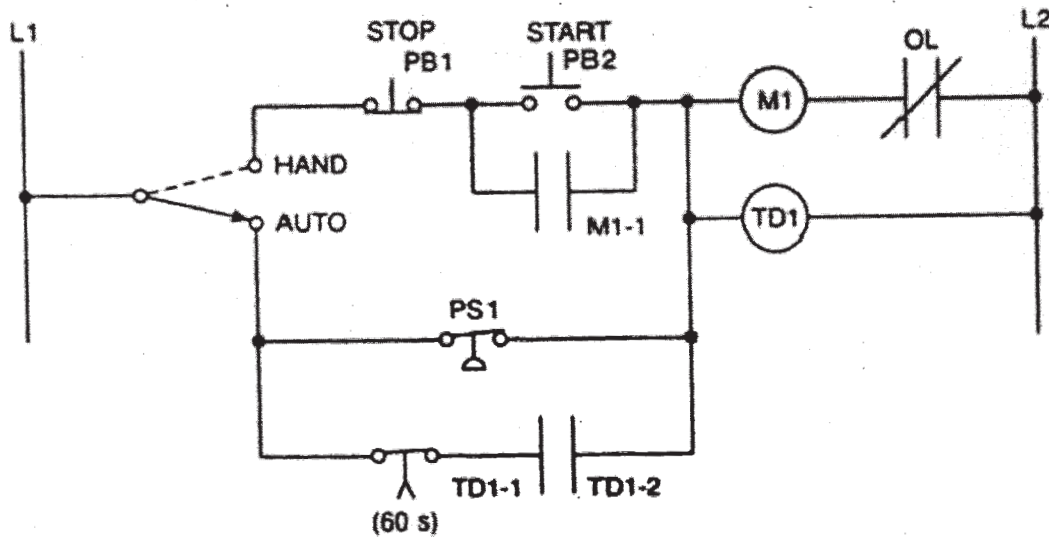


Figure Q7



Total No. of Questions : 7]

SEAT No. :

P3351

[Total No. of Pages : 3

[4660]-1102

M.E. (Mechanical-Mechatronics)

CONTROL SYSTEMS-II

(502808) (2013 Credit Pattern) (Semester-II)

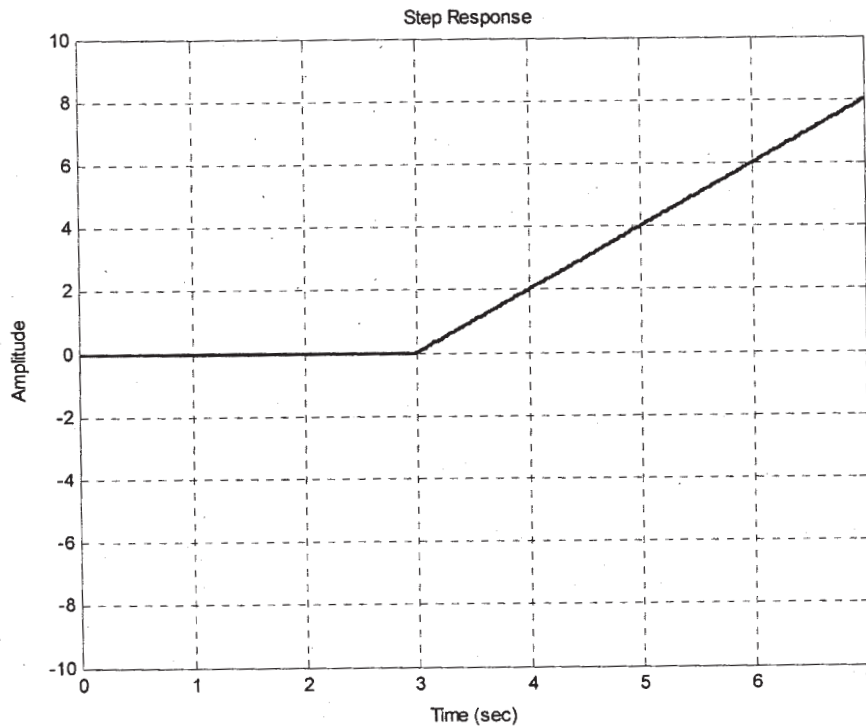
Time : 2 Hours]

[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 side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) The step response of a model is shown below. Using suitable technique identify the model. **[5]**

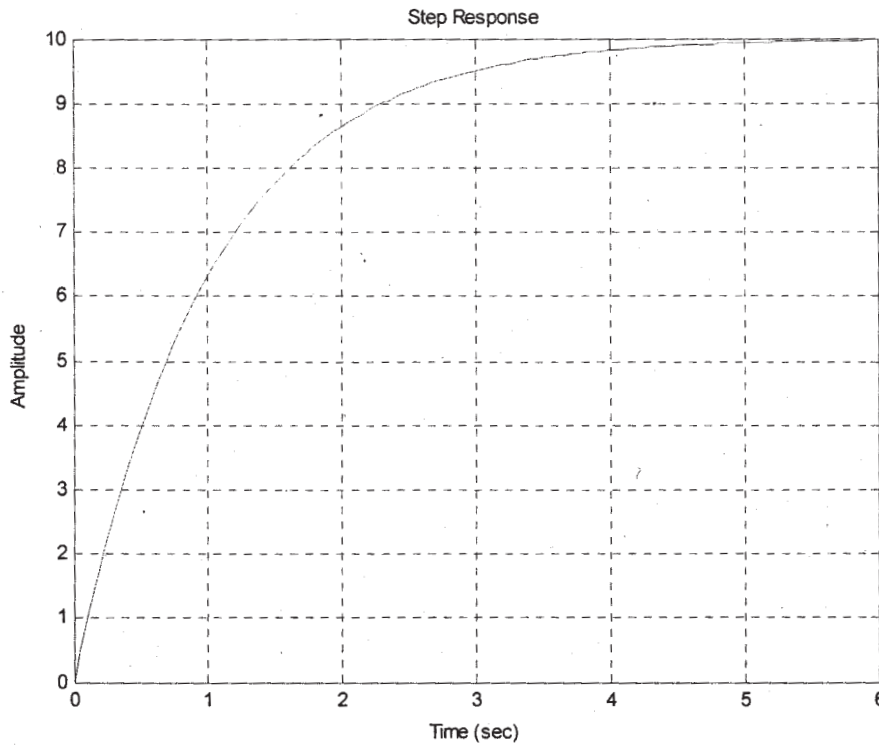


b) Write a short note on Nyquist Stability Criterion.

[5]

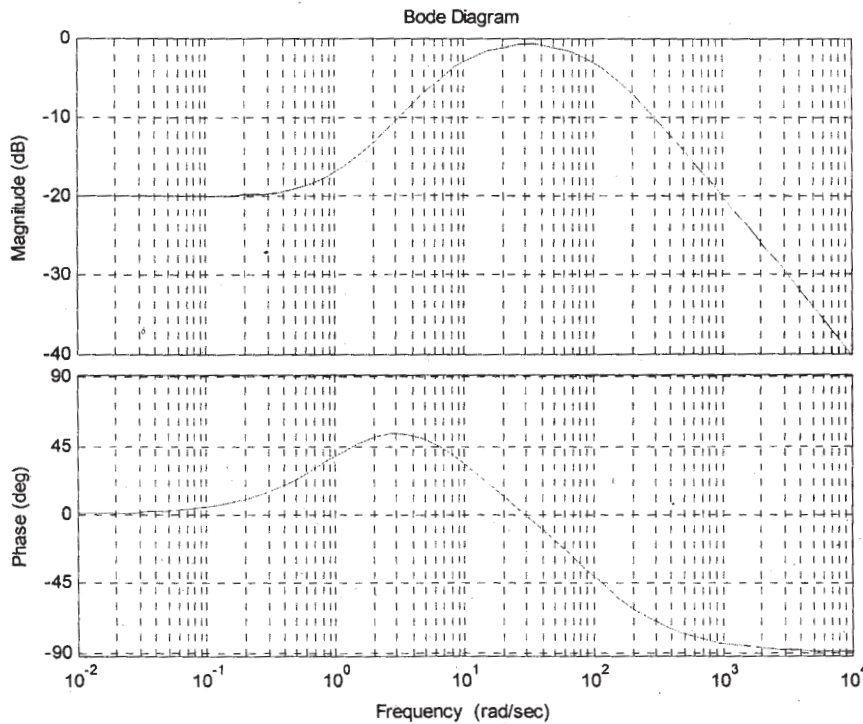
P.T.O.

Q2) a) The step response of a model is shown below. Using suitable technique identify the model. [5]



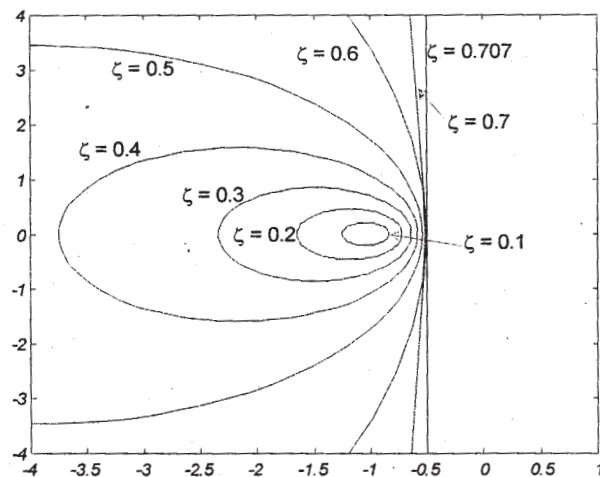
b) List the procedure for sketching the Bode Plot. [5]

Q3) a) Determine the approximate value of Gain and the Phase Margin from below plot. [5]



b) Discuss the importance of the “Integral” term in a PID control? [5]

- Q4) a)** Determine the maximum amplitude of the closed loop for below values of damping. **[4]**



- b) Derive the transfer function of a Proportional Derivative control in parallel form. **[6]**

- Q5) a)** Write a short note on Actuator Windup. **[5]**

- b) Using the ZN step response method determine the gains as well as the transfer function of the PID control. Assume $a=0.218$ and $L=0.806$. **[5]**

- Q6) a)** Write a short note on Internal Model Controller. **[5]**

- b) Write a short note on Loop Shaping. **[5]**

- Q7) a)** Write down the equations for, and discuss the relationship between Sensitivity and Gain Margin. **[4]**

- b) Discuss the advantages offered by Kappa Tau tuning technique W.R.T the ZN tuning. **[6]**



Total No. of Questions :8]

SEAT No. :

P3352

[4660]-1103

[Total No. of Pages :2

M.E. (Mechanical) (Mechatronics)
INDUSTRIAL DRIVES AND ACTUATORS
(2013 Credit Pattern) (Semester - II) (502809)

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) Explain transfer function model for small signal dynamic performance in case of DC servo drives. **[10]**

Q2) Explain the consideration in matching power electronic convertor and the motor, while selecting electric drive. **[10]**

Q3) a) Draw the circuit diagram, list the components, and explain the working and application of meter in circuit. **[5]**

b) Using solenoid operated direction control valve and proximity switches for determining the start and end of stroke, sketch a circuit for continuously reciprocating hydraulic cylinder with PLC Program. **[5]**

Q4) a) Explain speed control of three phase induction motor by using static slip recovery scheme. **[6]**

b) Explain reduced voltage method used to start three phase induction motor. **[4]**

Q5) a) Draw the symbol and explain the working of sequence valve and pressure compensated pressure relief valve used in hydraulic circuit. **[5]**

b) Discuss in brief, with hydraulic circuit symbols, types of hydraulic cylinders. **[5]**

P.T.O.

Q6) Explain synchronous servo motor drive with sinusoidal waveform. [10]

Q7) Draw the circuit diagram, list the components, and explain the working of the unloading circuit used in industrial hydraulics. [10]

Q8) Answer any two: [10]

- a) Discuss , in detail, the design considerations for hydraulic cylinder.
- b) With a neat sketch, describe construction and working of Pressure relief valve.
- c) Discuss in brief gear pump with respect to construction, working, typical specifications, and applications.

EEE

Total No. of Questions : 8]

SEAT No. :

P3214

[Total No. of Pages : 2

[4660]-1105

M.E. (Mechatronics) (Mechanical)

**MICROCONTROLLER APPLICATIONS IN
EMBEDDED SYSTEMS**

(602813) (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) *Assume suitable data, if necessary.*

Q1) a) Draw and explain block diagram of PIC 18F microcontroller with MPU and memory. **[4]**

b) Explain with neat diagram data memory of PIC 18F microcontroller. **[4]**

c) Explain the result after the execution of the following instructions. Identify the status of flags. **[2]**

MOVLW 0 × 89H

ADDLW 0 × 77H

Q2) a) What is assembler? Explain assembly language format in detail. **[4]**

b) Explain flow charting in problem solving approach. **[4]**

c) List out commonly used directives in PIC 18F microcontroller. **[2]**

Q3) a) Draw and explain block diagram of I/O Interfacing. **[4]**

b) Explain interfacing of output peripherals in PIC 18F microcontroller. **[4]**

c) Explain stack of PIC 18F microcontroller. **[2]**

Q4) a) Explain in detail different interrupts used in PIC 18F microcontroller. **[4]**

b) Draw and explain with block diagram Timer0 of PIC 18F in 8-bit Mode. **[4]**

c) Explain Timer applications. **[2]**

P.T.O.

- Q5)** a) Explain standards and protocols in serial data transfer. [4]
b) Explain with block diagram A-to D conversion in embedded systems. [4]
c) Explain with diagram synchronous versus asynchronous serial communication. [2]
- Q6)** a) Explain all the features of embedded systems. [4]
b) Explain in brief designing of embedded systems. [4]
c) Draw block diagram of Time and Temperature Monitoring Embedded systems with its specifications. [2]
- Q7)** a) Draw and explain support devices of PIC 18F microcontroller. [5]
b) List and explain the instructions used for logical operation and Arithmetic operation for PIC 18F microcontroller. [5]
- Q8)** a) Explain D-to-A conversion in PIC 18F microcontroller. [5]
b) Explain EIA-232 and PIC 18F serial communication module. [5]



Total No. of Questions : 8]

SEAT No. :

P3353

[4660]-1106

[Total No. of Pages : 2

M.E. (Mechanical Engineering) (Mechatronics)
FLEXIBLE MANUFACTURING SYSTEMS
(602814) (2013 Credit Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answers:*
 - a) *Any Two from Q. No. 1 to Q. No. 3,*
 - b) *Any Two from Q. No. 4 to Q. No. 6,*
 - c) *Any one from Q. No. 7 and Q. No. 8.*
- 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 and mention it clearly.*

Q1) a) Explain briefly the functions of computer control systems. **[6]**

b) Explain briefly the objectives of part storage capacity in terms of time periods of unattended operations. **[4]**

Q2) a) Define group technology and explain features of part classification and coding systems. **[5]**

b) Explain the four automated assembly system configurations in brief. **[5]**

Q3) Enlist and explain four basic components of FMS. **[10]**

Q4) a) Explain in brief FMS planning & implementation issues. **[6]**

b) Explain the “Duh-may-ick” six sigma procedure. **[4]**

Q5) a) Explain with neat diagram the basic functions of machine vision system. **[5]**

b) Explain the role of cause and effect diagram in shop floor control. **[5]**

P.T.O.

Q6) Write a CNC part program to turn a aluminum bar of $60 \square \times 60$ mm is shown in Fig. 1 Use *canned cycles* for both rough turning and finish cut. Assume feed rate (0.7mm/rev.) and spindle speed (900 RPM). **[10]**

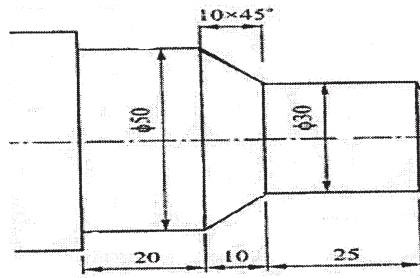


Fig. 1 Q. No. 6

- Q7)** a) Differentiate between traditional and modern quality control systems. **[5]**
b) Discuss Taguchi method in Quality Engineering. **[5]**
- Q8)** a) Explain the role of Just in time in manufacturing industries. **[5]**
b) Explain how inventory control helps to reduce lead time and cost of the product. **[5]**



Total No. of Questions : 7]

SEAT No. :

P3017

[Total No. of Pages : 2

[4660]-1110

M.E. (Mechanical) (Automotive Engineering) (Semester - I)

AUTOMOTIVE SAFETY AND REGULATIONS

(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 rules and electronic pocket Calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) What do you understand by vehicle safety? What are the objectives of it? List out various provisions of safety aspects incorporated in a modern car? [5]

b) What instrument is needed to study various parameters in a crash test? Give details. [5]

Q2) a) Explain with neat sketch anthropometry data for passenger compartment or modern day's car. [5]

b) Describe various design requirements for crash test dummies. [5]

Q3) a) Describe with neat sketch automobile seat. Explain various parts of it. [5]

b) What are the functions of car bumper? Explain various requirements of crashworthiness of it. [5]

Q4) a) What is the role of proper lighting and reflecting devices in automobile safety? Name different types of lighting and signaling devices used in modern automobiles? [5]

b) Explain briefly construction, working principle of head lamp and its testing procedure. [5]

P.T.O.

Q5) a) Explain asymmetrical beam used in head lamp. What is merits and demerits of plastic lens head lamps? [5]

b) Explain role of automobile seat anchorage. [5]

Q6) a) Draw neat sketch of specifying dimensions and color code as per motor vehicle act 1988 for following signs. [5]

i) No entry or straight prohibited.

ii) Right turn prohibited.

iii) Cross road.

iv) Parking both sides.

b) Explain briefly what procedure to be followed for passing a permit of commercial vehicles by regulatory authority RTO. [5]

Q7) Write short notes on the following (Any two) [10]

a) Reflex reflector.

b) Under run protection device.

c) Adoptive front lighting system.

d) Testing tracks for vehicles.



Total No. of Questions : 8]

SEAT No. :

P3448

[Total No. of Pages : 2

[4660] - 1111

**M.E. (Mech. - Design/Heat Power/Automotive/
Mechatronics/CADME/Energy Engg.)**

RESEARCH METHODOLOGY

End - Semester Assessment

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Answer any THREE questions from questions 1 to 5.*
- 2) *Answer any TWO questions from questions 6 to 8.*
- 3) *Figures on right indicate marks allotted.*
- 4) *Assume suitable data, wherever necessary.*

- Q1)** a) What are the objectives of research? [3]
b) Discuss the features of research design. [3]
c) What is hypothesis & explain the characteristics features of hypothesis? [4]
- Q2)** a) Why tabulation is considered essential in a research study? Narrate the characteristics of a good table. [5]
b) Write a brief note on different types of analysis of data pointing out the significance of each. [5]
- Q3)** a) Explain the difference between collection of data through questionnaires and schedules. [6]
b) Write a short note on 'rotation' in context of factor analysis. [4]
- Q4)** a) What are sources of literature? Explain various steps of literature review? Explain two methods of referencing? [7]
b) What are good characteristics of good research? [3]

P.T.O.

- Q5)** a) What is the necessity of defining a research problem? Explain. [5]
b) What is Chi-square test? Explain its significance in statistical analysis. [5]
- Q6)** a) What is mean by error analysis? Why it is necessary? Explain in detail with one example? [7]
b) Write short note on 'Design of Experiments'. [3]
- Q7)** a) Explain the framework of report writing. [5]
b) What are different sources of funding research? [5]
- Q8)** a) Present the instrumentation scheme with example and explain different characteristics of instruments? [7]
b) Explain the role of DSP in data collection in noisy environment. [3]



Total No. of Questions :7]

SEAT No. :

P3215

[4660]-1113

[Total No. of Pages :2

M.E. (Mechanical) (Automotive Engg.)
ENGINE COMBUSTION TECHNOLOGY
(2013 Credit Pattern) (Semester - II) (502307)

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) *All questions carry equal marks.*
- 5) *Assume suitable data, if necessary.*

Q1) a) A petrol consists of 86% carbon 14% hydrogen by mass. If fuel is burnt with 20% excess air and combustion is complete, estimate volumetric composition of products of combustion including water vapour formed. **[7]**

b) What is enthalpy of combustion? How does it differ from the enthalpy of reaction. **[3]**

Q2) a) Determine enthalpy of combustion of gaseous propane at 25°C and 1 atm. Using enthalpy of formation data

$$hf(\text{CO}_2) = -393520 \text{ KJ/Kmole}$$

$$hf(\text{H}_2\text{O}) = -285830$$

$$hf(\text{Propane}) = -103850 \text{ KJ/Kmole.} \quad \textbf{[5]}$$

b) A fuel is completely burned first with the stoichiometric amount of air and then with the stoichiometric amount of pure oxygen. For this case will the adiabatic flame temperature be higher? Why? **[5]**

Q3) a) What are the different pressure losses in the combustion system of a gas turbine? Suggest the methods to reduce them. **[5]**

b) What do you understand by flame stability? Why it is so important in the gas turbine combustion chamber. **[5]**

P.T.O.

- Q4)** a) What is the A:F ratio used in gas turbine when hot gas is supplied to the turbine. Comment on the values mentioned. [5]
- b) Discuss in brief the performance characteristics of gas turbine combustion system. Illustrate your answer by suitable curves. [5]
- Q5)** a) Discuss the effects of spray structure and spray penetration in CI engine combustion. [5]
- b) What are the design and operating factors affecting delay period? Describe. [5]
- Q6)** a) Explain normal and abnormal combustion in SI engine. [5]
- b) Discuss the general principles of S.I. engine combustion chamber design. [5]
- Q7)** a) Discuss following terms in connection with surface ignition. [5]
- i) Run on
 - ii) Run away
 - iii) Wild ping
 - iv) Rumble
- b) Explain swirl, squish and tumble. [5]

EEE

Total No. of Questions : 5]

SEAT No. :

P2991

[Total No. of Pages : 2

[4660] - 1114

M.E. (Mech.-Automotive) (Semester - II)

NOISE VIBRATION AND HARSHNESS

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any Two from each question.*
- 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) Explain in detail different sound fields? [5]
- b) What is the difference between FFT and CPB analysers? [5]
- c) Noises at the construction site is contributed by a few construction activities such as Piling work:104 dB, Scraper :93 dB,Bulldozer:94 dB, Mobile compressor:73 dB and mechanical shovel: 76 dB on A-weighting networks. What is the overall sound pressure level? [5]

Q2) Solve any Two questions.

- a) Explain Pass by Noise measurement of Vehicle . [5]
- b) What are the different methods of noise source identification available?[5]
- c) Explain the Digital signal processing. [5]

Q3) Solve any Two questions.

- a) Explain the Acoustic Holography technique. [5]
- b) What do you mean by sound intensity mapping? What is its significance in NVH? [5]
- c) Show that as the distance from a point source doubles, the sound intensity level decreases by 6 dB. [5]

P.T.O.

Q4) Solve any Two questions.

- a) Explain in detail any one excitation source used for modal analysis? [5]
- b) Explain the working of Helmholtz resonator type Muffler. [5]
- c) Explain the characteristic of absorptive material: [5]
 - i) Porosity
 - ii) Flow Resistant
 - iii) Tortuosity

Q5) Write a Short Note (Any two) :

- a) Anechoic chamber and Reverberation chamber. [5]
- b) Sound insulation. [5]
- c) Interior sources of noise in vehicle. [5]



Total No. of Questions : 7]

SEAT No. :

P2992

[Total No. of Pages : 2

[4660] - 1115

M.E. (Mechanical-Automotive Engineering) (Semester - II)

AUTOMOTIVE CHASSIS DESIGN

(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 fill marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Enumerate different types of springs used in automotive suspension. Discuss their characteristics and suitability of applications. **[5]**

b) Sketch and explain the construction and working of wishbone type IFS used on Indian vehicle. **[5]**

Q2) a) Explain the term Steering geometry. Explain with neat sketch. **[4]**

i) King Pin Inclination

ii) Caster, Camber

b) A cielo GLE car has a wheel base of 2520 mm and pivot centre of 1100 mm. The front and rear wheel tracks are 1400mm each. If the inside lock angle is 43° determine **[6]**

i) The correct outside lock Angle.

ii) Maximum and Minimum turning circle radius.

Q3) a) A Maruti Zen car moving at 80 kmph takes 32 meter to stop when the brakes are applied on it under standard test conditions. How much is its braking efficiency? Also determine the retardation produced during braking. **[5]**

b) Draw layout of booster hydraulic brake system and explain function of components each. **[5]**

P.T.O.

- Q4)** a) Sketch sectional view of tyre and indicate various parts of it. [5]
b) Give requirements of road wheels? How the wheels and tyres are designated? Explain. [5]
- Q5)** a) What are advantages of six wheel vehicles? Explain with help of sketch working of transmission system used in it. [5]
b) What is crawler tractor? Explain its principle working mechanism. [5]
- Q6)** a) Describe with neat sketch Power steering Mechanism used in modern Automobiles. [5]
b) Sketch and explain construction of Tandem Master Cylinder. [5]
- Q7)** Write short note on the following. (Any Two) [10]
a) Roll Center
b) Steering Gear box
c) Flat Run Tyres
d) Self Energizing disk brakes



Total No. of Questions : 5]

SEAT No. :

P2993

[Total No. of Pages : 2

[4660] - 1117

M.E. (Mechanical) (Automotive Engineering)

VEHICLE DYNAMICS

(2013 Pattern) (Semester - III)

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 the variation of tractive effort with longitudinal slip of tire. [5]
- b) Sketch the tire axis system and explain in brief. [5]
- c) Compare Bias Ply and Radial Ply tire for slip angle verses cornering force. [5]

Q2) Attempt any TWO.

- a) Derive the equation for maximum tractive effort that the tire ground can support in terms of coefficient of road resistance. [5]
- b) Write short notes on Gradability. [5]
- c) Explain the braking characteristics of two axle vehicle. [5]

Q3) Attempt any TWO.

- a) Explain the Anti-dive suspension geometry. [5]
- b) Find the geometry that would be necessary to achieve 100% anti-squat in the rear suspension and a 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 285 and 169 lb/in respectively. The CG height is 20.5 inches and wheel base is 108.5. [5]
- c) Define reference frame, toe-in, toe-out, wheel camber, caster and kingpin. [5]

P.T.O.

Q4) Attempt any TWO.

- a) Compare the curvature response of neutral steer, understeer and Oversteer vehicles. [5]
- b) Explain the steady-state handling characteristics of a two-axle vehicle. [5]
- c) Sketch and explain the handling behavior of car with and without vehicle stability control system. [5]

Q5) Attempt any TWO.

- a) Write short notes on Two degrees of freedom vehicle model for pitch and bounce. [5]
- b) Explain the concept of active and semi active suspension with neat sketch. [5]
- c) Explain the effect of wheelbase in road and suspension modelling. [5]



Total No. of Questions : 7]

SEAT No. :

P3423

[Total No. of Pages : 2

[4660]-1118

M.E. (Mechanical) (Automotive Engineering)

AUTOTRONICS

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Solve any five questions.*
- 2) *Each question carries equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions carry equal marks.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Explain role of electronics systems in automobiles. **[5]**

b) List down components of computerized Engine control system. Explain sensor interfacing with block diagram. **[5]**

Q2) a) Write a note on MPFI (Multi-Point Fuel Injection) **[5]**

b) Explain Emmission Control System. **[5]**

Q3) a) What is meant by Diagnostic Trouble codes for fault finding? Explain in brief. **[5]**

b) Explain thermostatic expansion valve and it's working. **[5]**

Q4) a) Explain working of air conditioning system in Automotive. **[5]**

b) Write a note on ATC (Automatic Temperature Control) System. **[5]**

P.T.O.

- Q5)** a) Write a note on electronic stabilizing program. [5]
b) Write a note on rollover protection system. [5]
- Q6)** a) Explain working of variable valve timing. [5]
b) Write a note on Gas Analyzers. [5]
- Q7)** a) List down different sensors used in Automobiles. Explain speed measurement sensor. [5]
b) List down safety systems in Automobiles. Explain seat belts in brief.[5]



Total No. of Questions : 8]

SEAT No. :

P2994

[Total No. of Pages : 3

[4660] - 1125

M.E. (Mechanical - Energy Engg.) (Semester - II)

ADVANCED HEAT TRANSFER

(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 side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) Derive the generalized heat conduction equation in polar co-ordinates? [10]

Q2) A long 20-cm-diameter cylindrical shaft made of stainless steel 304 (The properties of stainless steel 304 at room temperature are $k = 14.9 \text{ W/m}^\circ\text{C}$, $\rho = 7900 \text{ kg/m}^3$, $C_p = 477 \text{ J/kg}^\circ\text{C}$, and $\alpha = 3.95 \times 10^{-6} \text{ m}^2/\text{s}$) comes out of an oven at a uniform temperature of 600°C . The shaft is then allowed to cool slowly in an environment chamber at 200°C with an average heat transfer coefficient of $h=80 \text{ W/m}^2 \text{ }^\circ\text{C}$. Determine the temperature at the center of the shaft 45 min after the start of the cooling process. Also, determine the heat transfer per unit length of the shaft during this time period. [10]

Q3) a) Draw velocity boundary layer and thermal boundary layer for flow through tubes and flow over plate. [6]

b) Explain significance of any four dimensionless numbers in convection. [4]

Q4) A thin, flat plate that is 0.2 m by 0.2 m on a side is oriented parallel to an atmospheric airstream having a velocity of 40 m/s. The air is at a temperature of 20°C while the plate is maintained at 120°C . The air flows over the top and bottom surfaces of the plate, and measurement of drag force reveals a value of 0.075 N. What is the rate of heat transfer from both sides of the plate to the air? Properties of air $\rho = 1.125 \text{ kg/m}^3$ and $\mu = 18.4 \times 10^{-6} \text{ Pa}\cdot\text{s}$, $Pr = 0.71$, $k = 0.02635 \text{ W/m}\cdot\text{K}$. [10]

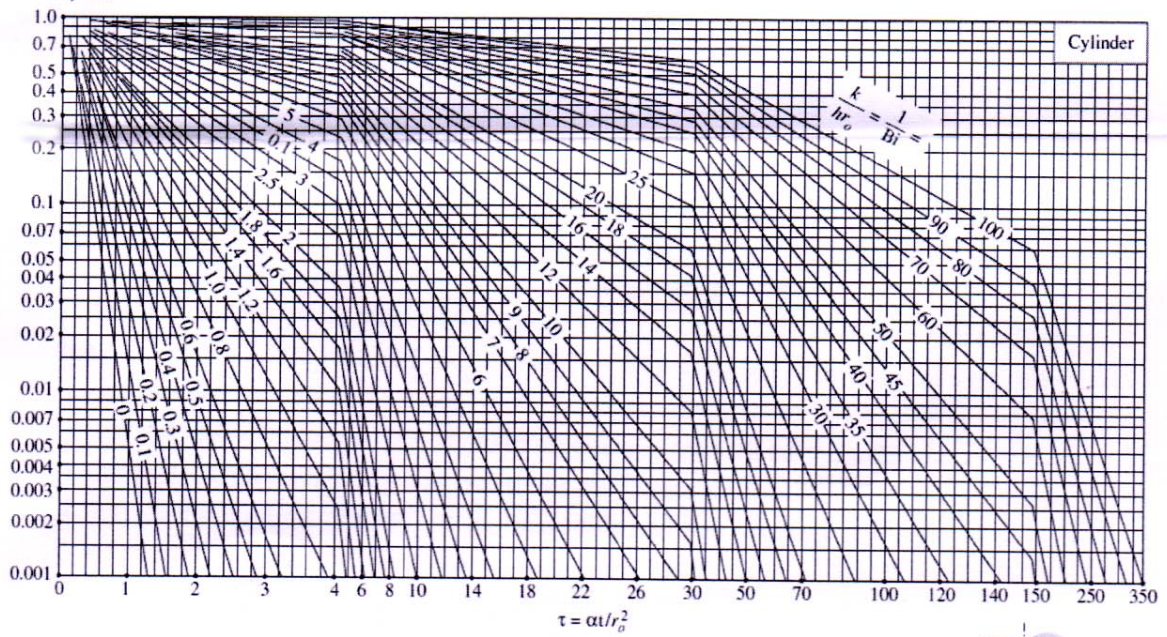
P.T.O.

- Q5)** a) Explain natural convection over surfaces in detail? [6]
b) Explain the term effective thermal conductivity in case of enclosure. [4]
- Q6)** a) Explain in detail flow boiling in vertical tube under forced convection. [6]
b) Explain the difference between Film wise condensation and drop wise condensation. [4]
- Q7)** a) Explain the term radiation view factor? [5]
b) Write a note on radiation shields and radiation effects. [5]
- Q8)** Consider the 5-m 5-m 5-m cubical furnace, whose surfaces closely approximate black surfaces. The base, top, and side surfaces of the furnace are maintained at uniform temperatures of 800 K, 1500 K, and 500 K, respectively. [10]

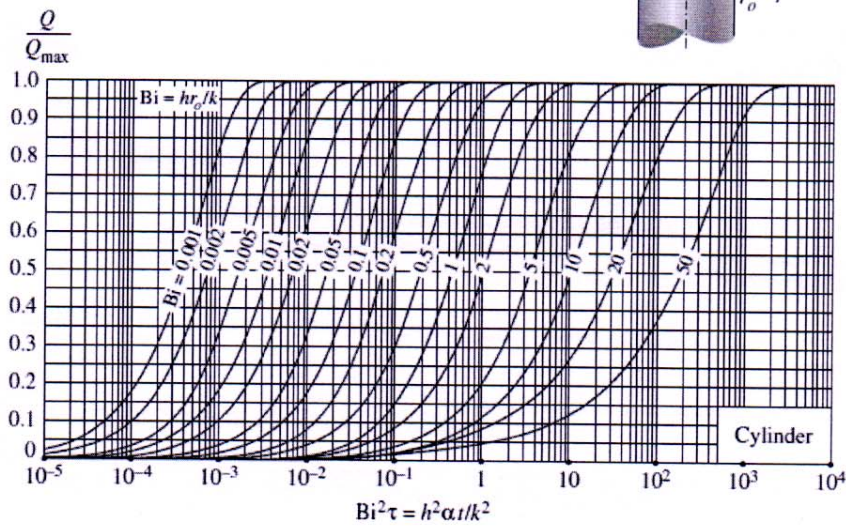
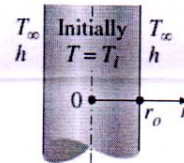
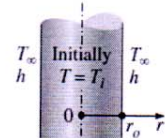
Determine-

- a) the net rate of radiation heat transfer between the base and the side surfaces,
- b) the net rate of radiation heat transfer between the base and the top surface, and
- c) the net radiation heat transfer from the base surface.

$$\theta_o = \frac{T_o - T_\infty}{T_i - T_\infty}$$



(a) Centerline temperature (from M. P. Heisler)



(b) Heat transfer (from H. Gröber et al.)



Total No. of Questions : 8]

SEAT No. :

P3216

[4660] - 1126

[Total No. of Pages : 2

**M.E. (Mechanical - Energy Engineering)
ENERGY CONVERSION SYSTEMS
(2013 Credit Pattern) (Semester - II) (502508)**

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 side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Describe procedures for measurement of moisture, measurement of volatile matter, measurement of ash content in the coal. **[6]**

b) Write classification of energy sources. **[4]**

Q2) The following particulars refer to a stage of a Parson's steam turbine comprising one ring of fixed blades and one ring of moving blades; Mean diameter of blade ring = 70cm, R.P.M. = 3000, Steam velocity at exit of the blades 160 m/s, Blade outlet angle = 20°, Steam flow through blades = 7kg/s.

Draw the velocity diagram and find the following **[10]**

- a) Blade inlet angle,
- b) Tangential force on the ring of moving blades,
- c) Power developed in a stage

Q3) a) List a few energy efficiency improvement options in a refrigeration plant. **[4]**

b) Explain any two compressors with their applications used for refrigeration system. **[6]**

P.T.O.

- Q4)** a) Explain the operating principle of a waste heat recovery boiler with examples. [6]
b) Explain the operating principle of a heat pump with examples. [4]
- Q5)** a) Explain capacity of the compressor and various efficiencies of the compressor. [5]
b) Define various components of the compressed air system. [5]
- Q6)** a) Describe advantages of adopting Diesel power plants. [4]
b) Energy Saving Opportunities in Cooling Towers. [6]
- Q7)** Explain in detail any two methods to improve the efficiency of gas turbine power plant with cycle analysis. [10]
- Q8)** a) Explain design procedure of Francis turbine. [5]
b) Explain working proportions for Pelton turbine. [5]



Total No. of Questions :7]

SEAT No. :

P3355

[4660]-1127

[Total No. of Pages :2

M.E. (Mechanical Engineering) (Energy Engineering)

ENERGY MANAGEMENT

(2013 Credit Pattern) (Semester - II) (502509)

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 Objectives of the Energy Management System. [5]
b) Explain the various types of sources of energy in world energy market. [5]
- Q2)** a) Write in short the steps involved in energy audit of Steam power Plant. [5]
b) What are the benefits of benchmarking the energy consumption? [5]
- Q3)** a) Explain Excess Air Control in boiler combustion for maximum efficiency. [5]
b) What are Steam Traps? Explain functions of Steam Traps and their applications. [5]
- Q4)** a) Explain in detail the energy efficiency improvements in Energy Efficient Motors. [5]
b) Discuss the energy saving opportunities in Compressed air systems. [5]
- Q5)** a) Explain the Topping and Bottoming cycle of cogeneration. [5]
b) Explain concept of pinch and Target Setting in Heat Exchanger Networking. [5]

P.T.O.

- Q6)** a) Explain Aspects of Nuclear Waste Management. [5]
- b) Explain Fundamental processes for the evaluation Waste Management Systems. [5]

Q7) Write a short note on (any two): [10]

- a) Energy Audit (Types and Methodology).
- b) Energy efficient windows.
- c) Heat wheels.



Total No. of Questions : 7]

SEAT No. :

P3356

[Total No. of Pages :2

[4660]-1129

M.E. (Mechanical) (Energy Engineering)

NUCLEAR MATERIAL AND REACTOR FUNDAMENTALS

(Semester-III) (2013 Credit Pattern)(602513)

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 the fission process using the liquid drop model of a nucleus. **[4]**

b) Define the following terms: **[6]**

- i) Radioactivity
- ii) Curie
- iii) Becquerel

Q2) a) A sample of material contains 20 micrograms of californium-252. Californium -252 has a half-life of 2.638 years. **[6]**

Calculate:

- i) The number of californium-252 atoms initially present
- ii) The activity of the californium-252 in curies
- iii) The number of californium -252 atoms that will remain in 12 years
- iv) The time it will take for the activity to reach 0.001 curies

b) Why uranium-235 fissions with thermal neutrons and uranium-238 fissions only with fast neutrons? Explain in detail. **[4]**

Q3) a) Describe the following reactions where a neutron is absorbed in a nucleus: **[6]**

- i) Radioactive capture
- ii) Particle ejection

b) Explain the effect of radiation damage on nuclear materials. **[4]**

P.T.O.

- Q4)** a) Differentiate between Boiling water reactor (BWR) Pressurized heavy water reactor (PWR) with neat sketch. [5]
- b) How nuclear fuel rods are manufactured? Explain in detail. [5]
- Q5)** a) Explain various grades of enriched uranium and their applications. [5]
- b) What is In-situ leaching? Explain in detail. [5]
- Q6)** a) Describe the relationship between the delayed neutron fraction, average delayed neutron fraction, and effective delayed neutron fraction. [5]
- b) What is the purpose of control rod and moderator in nuclear reactor? Explain various types of control rods and moderators. [5]
- Q7)** a) Explain the following processes of nuclear fuel enrichment. [10]
- i) Gaseous diffusion.
- ii) Centrifuge process.



Total No. of Questions : 7]

SEAT No. :

P3357

[4660]-1130

[Total No. of Pages : 2

M.E. (Mechanical) (Energy Engineering)
ENERGY SYSTEMS MODELLING AND ANALYSIS
(602514) (2013 Credit Pattern) (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 indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of calculator is allowed.*

Q1) Explain any two types of system study. **[10]**

Q2) Derive general formula to fit $a + bx + cx^2$ or $ax^2 + bx + c$ using “Least square regression method.” Also write general procedure to solve problem. **[10]**

Q3) Write short note on: **[10]**
a) Interaction between models.
b) Comparison the simulation and analytical methods.

Q4) A manufacturer produces three types of plastic fixtures. The time required for molding, trimming, and packaging is given in Table (Times are given in hours per dozen fixtures.) **[10]**

Process	Type A	Type B	Type C	Total time available
Molding	1	2	$\frac{3}{2}$	12,000
Trimming	$\frac{2}{3}$	$\frac{2}{3}$	1	4,600
Packaging	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{2}$	2,400
Profit	\$11	\$16	\$15	-

How many dozen of each type of fixture should be produced to obtain a maximum profit?

P.T.O.

- Q5) a)** The cost C per unit mass of material processed in an extrusion facility is given by the expression

$$C = 2T^2V + \frac{3T}{V^2} + \frac{2}{T}$$

Where; T is the dimensionless temperature of the material being extruded, V is the dimensionless volume flow rate, and C includes both capital and running costs. Determine the minimum cost. **[5]**

- b) Explain basis, objective and example of “Pinch Analysis”. **[5]**

- Q6) a)** Explain Uniform Dichotomous Search technique and write its algorithm to find optimum design. **[5]**

- b) Find the minimum of $f = x(x - 1.5)$ using exhaustive search method in the interval $(0.0, 1.00)$ Take $\Delta x = 0.1$. **[5]**

- Q7)** Write a short note on: **[10]**

- a) Interval of uncertainty and reduction ratio.
b) Golden section search method.



Total No. of Questions : 7]

SEAT No. :

P2995

[Total No. of Pages : 1

[4660] - 1134

M.E. (Mechanical) (CADM & E) (Semester - I)

COMPUTER AIDED DESIGN

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five questions from the following.*
- 2) Neat diagram 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) Explain with neat sketch, β - spline curves and state its advantages. [10]

Q2) Explain the C.G.S. approach of solid modelling? [10]

Q3) What do you understand by C rep & B - rep approaches? Compare them. [10]

Q4) Explain in detail the concept of constrained based modelling? [10]

Q5) Derive the parametric representation of Bezier curve. State its limitation. [10]

Q6) Discuss the need for standardization in computer graphics. [10]

Q7) How are hidden lines and hidden surfaces algorithms classified? Explain each one of them briefly? [10]



Total No. of Questions : 7]

SEAT No. :

P3359

[Total No. of Pages : 1

[4660] - 1137
M.E (Mechanical) (CADM & E)
COMPUTER INTEGRATED MANUFACTURING
(2013 Credit Pattern) (Semester - II) (502407)

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) What are the Hardware requirements for CIM? Elaborate. **[10]**

Q2) What you mean by Networking in Manufacturing. Give suitable example. **[10]**

Q3) What is Product Data Management (PDM) in CIM? List Advantages of PDM. **[10]**

Q4) What are the various components of Flexible Manufacturing System? Explain Material Handling Stations with neat sketches. **[10]**

Q5) Describe in brief Just in Time and Cellular Manufacturing. **[10]**

Q6) How the Manufacturing Processes are integrated with Web? Give its applications in Foundry and Machine Shop. **[10]**

Q7) Explain the concept of Lean Production? What are the benefits of Lean Manufacturing? **[10]**



Total No. of Questions : 7]

SEAT No. :

P3217

[4660] - 1138

[Total No. of Pages : 1

M.E. (Mechanical) (CADM & E)
INDUSTRIAL PRODUCT DESIGN AND PRODUCT LIFE
CYCLE MANAGEMENT
(2013 Credit Pattern) (502408)

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) Use of Calculator is allowed.*
- 5) Assume Suitable data if necessary.*

Q1) Explain the role of Technology Forecasting and S-Curve in New Product Development. **[10]**

Q2) Discuss 6-3-5 method for Concept Generation with Suitable example. **[10]**

Q3) Discuss any two types of Product Portfolios in detail with case studies. **[10]**

Q4) Discuss various PLM characteristics in detail. **[10]**

Q5) What is PLM Strategy? Elaborate the importance. **[10]**

Q6) What are Change Management and Configuration Management in PLM? Discuss. **[10]**

Q7) Elaborate systematic procedure of Benchmarking. **[10]**



Total No. of Questions :7]

SEAT No. :

P3218

[4660]-1139

[Total No. of Pages :1

M.E. (Mechanical) (CADM & E)
AUTOMATED MANUFACTURING SYSTEM MODELING
(2013 Credit Pattern) (Semester - II) (502409)

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) Define Performance Measure for Automated Manufacturing System? Explain any four in detail. **[10]**

Q2) Explain Discrete Time Markov Chain Models. **[10]**

Q3) Discuss Semi-Markov Processes in Manufacturing. **[10]**

Q4) What are Petri Nets? Explain Classical Petri nets with suitable example. **[10]**

Q5) Explain steady state analysis of M/M/m Queue. **[10]**

Q6) Discuss Open Queue and Closed Queue Networks. **[10]**

Q7) Explain Deadlock Analysis using Petri Nets.. **[10]**

EEE

Total No. of Questions : 7]

SEAT No. :

P3360

[Total No. of Pages : 1

[4660] - 1141
M.E. (Mechanical) (CADM & E)
SIMULATION MODELING
(2013 Credit Pattern) (Semester - III)

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) Explain Linear Congruential Method for random number generation. Elaborate any one method of testing of random numbers. **[10]**

Q2) What are the steps in simulation study? Discuss limitations of simulation modeling? **[10]**

Q3) Discuss in detail Triangular Distribution and Empirical Continuous Distribution. **[10]**

Q4) Represent stages in model building with neat flow diagram. Explain verification and validation in model building. **[10]**

Q5) X is normally distributed variable with mean $\mu = 30$ and standard deviation $\sigma = 4$. Assume Φ to denote cumulative probability. Find : a) $P(x < 40)$, b) $P(x > 21)$, c) $P(30 < x < 35)$. Given: $\Phi(-2.25) = 0.00122$, $\Phi(0) = 0.5$, $\Phi(1.25) = 0.8944$, $\Phi(2.5) = 0.9938$. **[10]**

Q6) Explain usefulness of any two simulation packages with their capabilities in simulation modeling. **[10]**

Q7) Explain different Performance Measures in Manufacturing System Modeling. **[10]**



Total No. of Questions : 7]

SEAT No. :

P3421

[Total No. of Pages : 2

[4660] - 1142

M.E. (Mechanical) (CADM & E) (Semester - III)

OPTIMIZATION TECHNIQUES

(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 indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) Maximize

$$F = x_1 + 2x_2 + x_3$$

Subject to

$$2x_1 + x_2 - x_3 \leq 2$$

$$-2x_1 + x_2 - 5x_3 \geq -6$$

$$4x_1 + x_2 + x_3 \leq 6$$

$$x_i \geq 0, i = 1, 2, 3$$

Using simplex method.

[10]

Q2) Discuss Exhaustive search method & bounding phase method for bracketing. [10]

Q3) Minimize

$$f(x) = x^2 + 54/x$$

Using Newton Raphson method

[10]

P.T.O.

Q4) Explain in detail Powell's conjugate direction method. **[10]**

Q5) Minimize

$$f(x_1, x_2) = (x_1^2 + x_2 - 11)^2 + (x_1 + x_2^2 - 7)^2$$

Assume initial point $x^{(0)} = (0, 0)^T$

Use any method. **[10]**

Q6) Discuss in brief simulated annealing & particle swarm optimization. **[10]**

Q7) Minimize

$$f(x) = (x_1^2 + x_2 - 11)^2 + (x_1 - x_2^2 - 7)^2$$

Subject 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]



Total No. of Questions : 8]

SEAT No. :

P2996

[Total No. of Pages : 2

[4660] - 1144

M.E. (Electrical) (Control System)

COMPUTER TECHNIQUES IN CONTROL SYSTEMS

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answers Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 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) Use analytical method to investigate for extremum point [9]

$$f(x) = x_1^3 + x_2^3 + x_3^3 + 3x_1^2 + 6x_2^2 + 9x_3^2$$

Q2) Use analytical method to investigate for extremum point [9]

$$f(x) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$$

Q3) Explain what do you understand by Lagrange Function. [9]

Q4) Explain what do you understand by Multivariable Optimization with no constraint. Write necessary and sufficient condition. [9]

Q5) Explain method of conversion of non serial system to serial system problem. [16]

Q6) Use simplex method to solve [16]

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

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

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

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

$$X_1, X_2, X_3, > 0$$

P.T.O.

- Q7)** a) Explain the Gomory's cutting plane method. [8]
b) Explain the integer nonlinear programming. [8]

Q8) Minimize $f = -3x_1 - 4x_2$ [16]
subject to $3x_1 - x_2 + x_3 = 10$
 $3x_1 + 11x_2 + 2x_4 = 64$
 $x_i \geq 0, i = 1$ to 4 and x_i is integer



Total No. of Questions : 6]

SEAT No. :

P2998

[Total No. of Pages : 2

[4660] - 1146

M.E. (Electrical) (Control System)
NONLINEAR CONTROL SYSTEM
(2013 Pattern)

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) a)** Explain with neat diagram following terms for nonlinear control system.
- i) Frequency - Amplitude dependance [4]
 - ii) Limit cycle
 - iii) Jump resonance
 - iv) Soft and hard excitation
- b) Using isocline method draw phase plane trajectory for a system $G(s) = \frac{1}{s(s+2)}$ with on - off relay. output amplitude of relay is ± 1 & $x_1(0) = 0, x_2(0) = 1$ [5]
- c) Derive an expression for describing function for saturation nonlinearity. Also explain stability analysis by describing function method. [5]
- d) Explain the terms in the sense of hyapunov [4]
- i) Stability
 - ii) Asymptotic stability
 - iii) Asymptotic stability in large
 - iv) Instability

OR

- Q2) a)** Explain with neat diagram following nonlinearities present in system [4]
- i) Relay with dead zone
 - ii) Relay with Hysteresis
 - iii) Saturation
 - iv) Backlash

P.T.O.

- b) Find nature of singular point by phase plane method for the system
 $G(s) = \frac{1}{s(s+2)}$ with cascaded relay having dead zone ± 1 and amplitude ± 2 . Initial condition $x_1(0) = 1$ $x_2(0) = 0$ [5]
 c) Derive expression for relay with hysteresis by describing function method. [5]
 d) Explain delta method for phase plane trajectory method. [4]

- Q3)** a) For the LTI system having
 $\dot{x} = Ax$ derive expression
 $A^T P + PA = -Q$ where P & Q are square symmetric positive definite matrices. [8]
 b) An autonomous system is given by
 $\dot{x}_1 = -x_1 + 2x_2$
 $\dot{x}_2 = -2x_1$
 Apply hypunov direct method to determine stability of the system. [8]

OR

- Q4)** a) Explain Krasovskii method to generate a Lypunov function. [8]
 b) An autonomous system is given by $A = \begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix}$
 Derive hypunov function and stability of the system. [8]

- Q5)** Explain for the given system [16]
 a) Input output linearization
 b) Input state linearization for $\dot{x}_1 = x_1^2 + x_2 + u$
 $\dot{x}_2 = -2u$

OR

- Q6)** Write short note on [16]
 a) Input output linearization
 b) Input state linearization
 c) Sliding mode control



Total No. of Questions : 4]

SEAT No. :

P2999

[Total No. of Pages : 2

[4660] - 1147

M.E. (Electrical - Power Systems) (Semester - I)

RESEARCH METHODOLOGY

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if necessary.*

Q1) a) Distinguish between Research methods and Research methodology. **[5]**

OR

Explain clearly with examples the difference between applied and fundamental research. **[5]**

b) Discuss the importance of literature review in defining a research problem. **[4]**

OR

Explain the important points to be observed by a researcher in selecting a research problem. **[4]**

Q2) a) What are the important features of a good research design? **[5]**

OR

Explain the following concepts related to research design. **[5]**

- i) Dependent and independent variable
- ii) Extraneous variable

b) Explain the following processing operations in context of data collection and analysis. **[4]**

- i) Editing
- ii) Coding

OR

What are the different parameters of measurement of asymmetry of data? **[4]**

P.T.O.

Q3) Solve any four questions. **[16]**

- a) List the different steps involved in making oral presentation.
- b) Different types of reports.
- c) Basic structure of ME thesis.
- d) Features of Latex for preparation of technical reports.
- e) Difference between Technical report and thesis.

Q4) a) Explain different steps involved in preparation of a research proposal. **[10]**

OR

What are the different funding agencies and different schemes for engineering research?

b) Explain the important contents of a standard Journal Paper. **[6]**

OR

Explain the concept of review paper.



[4660]-1149

M.E. (Electrical) (Control System) (Semester - II)**MULTIVARIABLE AND OPTIMAL CONTROL SYSTEM****(2013 Pattern)***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) a) Explain with neat block diagram the structure of a multivariable control system. Discuss an example of any industrial multivariable control system. **[4]**

b) The overall transfer matrix of a multivariable control system is given by :

$$T(S) = \frac{Y(S)}{U(S)} = \begin{bmatrix} \frac{1}{S+4} & \frac{1}{S} \\ \frac{1}{S+2} & \frac{2}{S+3} \end{bmatrix}$$

Obtain the state space form of the system. **[6]**

c) A multiple input - multiple output system is represented in the state space form:

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -7 & 0 \end{bmatrix} x(t) + \begin{bmatrix} 0 & 0 \\ 1 & 0 \\ 0 & 1 \end{bmatrix} u(t)$$

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

Investigate the controllability and observability of the system. **[8]**

OR

P.T.O.

Q2) a) A linear time invariant control system is represented in state space form:

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

Design the Linear state variable Feedback to place the poles at desired locations : $S = -3, -4$ and -5 . **[8]**

- b) Discuss any one classical method which can be extended to analysis of multivariable control system. State its limitations. **[4]**
- c) State and explain the infinite - time state regulator problem. Outline the procedure for obtaining the optimal control law for infinite - time state regulator problem. **[6]**

Q3) a) State the Pontryagin's minimum Principle. What are the difficulties in applying this principle in case of discrete - time system. **[6]**

- b) Explain step by step the procedure for solving optimal control problem using Pontryagin's minimum principle. Explain various boundary conditions associated with this principle. **[10]**

OR

Q4) a) State and explain the Pontryagin's minimum principle. Discuss any one application of this principle in optimal control system. **[6]**

- b) A linear time - invariant control system is given by:

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

Using Pontryagin's minimum principle, find the optimal control law u^* which minimizes the preformance index

$$J = \frac{1}{2} \int_{t_0}^{t_1} [x_2^2 + u^2] dt$$

The control inequality constraints are given by

$$|u(t)| \leq 2 \text{ for all } t \in [t_0, t_1] \quad \mathbf{[10]}$$

Q5) a) Explain the Bang - bang control system and state the advantages of Bang - bang controller. **[6]**

b) For the control system described by the state equation:

$$\dot{x}_1(t) = x_2(t) + u(t)$$

$$\dot{x}_2(t) = -x_1(t)$$

Find the optimal control $u^*(t)$ which transfers the system from initial state $x_1(0) = x_2(0) = 1$ to the origin $x_1 = x_2 = 0$ in minimum time. The control is constrained as $|u(t)| \leq 1$. **[10]**

OR

Q6) a) Draw the appropriate block diagram showing the structure of feedback time - optimal (minimum time) control system and outline clearly the procedure of solving the minimum - time optimal control problem with constraint on control input. **[10]**

b) Define normal system and explain with example the meaning of singular control system. **[6]**



Total No. of Questions : 6]

SEAT No. :

P3219

[4660] - 1150

[Total No. of Pages : 3

M.E. (Electrical) (Control Systems)
SYSTEM IDENTIFICATION & ADAPTIVE CONTROL
(2013 Credit Pattern) (Semester - II) (503108)

Time :3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answers Q.1 or 2, Q.3 or 4 and Q.5 or 6.*
- 2) *Write all Questions in the same Answer -book.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of Nonprogrammable Calculator is allowed.*
- 6) *Assume Suitable data, if necessary.*

Q1) a) Explain the Parametric and Nonparametric methods of system identification. **[4]**

b) Triangularize the Matrix $A = \begin{bmatrix} 1 & 1 \\ 1 & 2 \\ 1 & 3 \end{bmatrix}$ by using QR method such that

$Q^T A = \begin{bmatrix} R \\ 0 \end{bmatrix}$, where R is upper triangular matrix and Q is an orthogonal matrix. **[5]**

c) Write detailed notes on Parametric and Nonparametric training methods. **[4]**

d) What are the different ideas used while designing the gain scheduling controllers? Explain any one of them. **[5]**

OR

Q2) a) Classify the different technique of system identification. **[4]**

P.T.O.

- b) Name the various computational methods used in system identification. Explain the Q R-factorization of matrix A such that $A = QR$, where Q is an orthogonal matrix and R is the upper triangular matrix. [5]
- c) Write the detailed notes on “Ship Steering Dynamics”. [4]
- d) Prove the matrix inversion Lemma. [5]

$$[A + BCD]^{-1} = A^{-1} - A^{-1} B [C^{-1} + D A^{-1} B]^{-1} D A^{-1}$$

Q3) a) Consider a process characterized by the transfer function

$$G(s) = \frac{K}{1 + sT} e^{-sL},$$

where K is the static gain, L is the apparent time delay and T is the apparent time constant. Explain Ziegler Nichols step-response method to determine the parameters of PID controller. [8]

b) In a unity feedback control system, a linear transfer function

$$G(s) = \frac{10}{s(s+1)(s+10)}$$

is connected in cascade with an ideal relay having saturation level +/-1. Using the Describing Function method evaluate the ultimate gain K_u and the ultimate period T_u . [8]

OR

Q4) Write detailed notes on any two of the followings:

- a) Self Tuning Regulator (STR). [8]
- b) Various Adaptive Schemes. [8]
- c) Diophantine equation. [8]

Q5) a) State and explain the MIT Rule. Explain, with neat diagrams, Model Reference Adaptive Scheme (MRAS). [6]

b) Consider a process $G(s) = \frac{1}{s(s+a)}$, where a is an un known parameter.

Based on the gradient theory, determine the controller of an MRAS that gives closed loop system as $G_m(s) = \omega^2 / (s^2 + 2\xi\omega s + \omega^2)$. [10]

OR

Q6) a) An integrator $G(s) = \frac{b}{s}$; is to be controlled by a zero order continuous controller $u(t) = -s_0 y(t) + t_0 u_c(t)$.

The desired response model is given by $G_m(s) = b_m/(s + a_m)$. Derive, using Lyapunov theory, a parameter update law of an MRAS guaranteeing that the error $e = y - y_m$ goes to zero. Try the Lyapunov function

$$V(e, s_0, t_0) = \frac{1}{2} \left(e^2 + (b s_0 - a_m)^2 / (b\gamma) + (b t_0 - b_m)^2 / (b\gamma) \right); \text{ where } e(t) = y(t) - y_m(t). \quad [12]$$

b) Construct the simulation diagram of above MRAS. [4]



Total No. of Questions : 6]

SEAT No. :

P3000

[Total No. of Pages : 2

[4660]-1151

M.E. (Electrical) (Control System)
ADVANCED DIGITAL CONTROL TECHNIQUES
(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Figures to the right side indicate full marks.*
- 2) *Use of Calculator is allowed.*
- 3) *Assume suitable data if necessary.*

- Q1)** a) Elaborate digital modeling with sample and hold devices. What are the important considerations while selecting the value of sampling period? [9]
- b) Write a short note on 'design by separation principles'. [9]

OR

- Q2)** a) Explain the concept of digital re- design in detail. [9]
- b) Explain digital simulation with numerical Integration. Explain the methods. [9]

- Q3)** a) Design FIR Filter using Hanning Window to obtain following specifications: [8]

$$H_d(e^{j\omega}) = 1 \quad \text{for } \Pi/4 \leq |\omega| \leq \Pi$$
$$= 0 \quad \text{for } |\omega| \leq \Pi/4$$

Find the values of $h(n)$ for $N = 11$. Find $H(z)$.

- b) Explain the concept of instruction pipeline. [8]

OR

- Q4)** a) What are the advantages of TMS 320C54X? [8]
- b) What is Discrete Wavelet Transform? Explain in detail. [8]

P.T.O.

- Q5)** a) Draw and explain memory architecture of TMS 320C54X processor. **[8]**
b) Explain instruction set of TMS 320C54X DSP. **[8]**

OR

- Q6)** a) What are the applications of TMS320 typical DSP processor? **[8]**
b) What are the key features of TMS 320C5X? **[8]**



Total No. of Questions : 6]

SEAT No. :

P3220

[Total No. of Pages : 2

[4660]-1153

**M.E. (Electrical) (Control System)
ADVANCED DRIVES & CONTROL
(603101) (2013 Credit Pattern) (Semester-III)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Figures to the right side indicate full marks.*
- 2) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) Explain the steady state operation of the electrical drive. Prove the steady state stability criterion. State the assumptions. **[4]**
- b) Write a note on spatial MMF distribution in the airgap of three phase inverter fed Induction motor. Discuss the effect of space harmonics and production torque pulsations. **[5]**
- c) Why choppers are preferred for speed control of DC motors? State the applications. **[4]**
- d) How does the slip power recovery scheme have been utilised in static krammer drive. **[5]**

OR

- Q2)** a) Explain in detail thermal consideration of the given rating of motor. **[4]**
- b) Explain with reference to the waveforms of the armature current, single phase fully controlled d.c. drive for continuous conduction. **[5]**
- c) Write a note on direct torque control of electric drive. **[4]**
- d) Differentiate voltage source Inverter with current source inverter supplying 3 phase induction motor on the basis of following: **[5]**
- i) Control of frequency and (v/f) control.
 - ii) Performance of motor.

P.T.O.

- Q3)** a) Explain with reference to permanent magnet synchronous motor drive: [8]
- i) Sinusoidal back emf pattern.
 - ii) Trapezoidal back emf pattern.
- b) Explain switched reluctance motor drive. [8]

OR

- Q4)** a) Write a detail note on wound field machine drive. [8]
- b) Explain the solid state controller for permanent magnet synchronous motor drive. [8]

- Q5)** a) Explain the principle of phase locked loop (PLL) system & discuss the application of PLL in the closed loop controlled drives. [8]
- b) Explain the role of following controller in electric drive system. [8]
- i) PID controller.
 - ii) Proportional & integral controller.

OR

- Q6)** a) Write a note in detail on modern trends in Electric drive control. [8]
- b) Explain the effect of RMS voltage variation on the performance of the solid state controlled drive. [8]



Total No. of Questions : 6]

SEAT No. :

P3001

[Total No. of Pages : 3

[4660]-1154

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

COMPUTER AIDED CONTROL SYSTEM DESIGN

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) Attempt all 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) Explain the concepts 'Relative stability' and 'Absolute stability'. Explain the measures of relative stability using polar plot and Bode diagrams. [5]
- b) Compare cascade compensation with feedback Compensation. Discuss the conditions under which the feedback compensation is preferred. [5]
- c) Outline the Computer method for obtaining the transient response of a linear closed-loop control system represented by the transfer function $\frac{C(s)}{R(s)}$. Give its algorithm and draw the flow chart. Also explain how to reshape this transient response plot to obtain desired response. [8]

OR

- Q2)** a) Explain the computer method for determining the controllability and observability of the control system. Draw the flow chart and give its algorithm. [6]
- b) Explain what do you mean by full order observer. Draw the block diagram of observer system. [4]
- c) Explain with block diagram the pole-placement design method using linear state variable feedback. A certain linear control system is represented in state space form :

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -10 & -1 & 0 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$

P.T.O.

Design the linear state variable feedback gain matrix 'K' to place the poles at desired locations:

$$S = -2, -3 \text{ and } -4. \quad [8]$$

Q3) a) What are the considerations for the selection of P, PI and PID controller? Explain why the derivative controller is not used in isolated mode. [8]

b) Explain with algorithm the computer method of design of PID controller using Ziegler-Nichols method. State the limitations of this method. [8]

OR

Q4) a) Explain with neat diagrams the working of P, PI and PID controller as standard compensator. [6]

b) Consider a process control system with plant transfer function

$$G_p(s) = \frac{30}{s^3 + 10s^2 + 31s + 30}$$

Design a PID controller for this system using Ziegler-Nichols method. [10]

Q5) a) Discuss the advantages of digital controller over continuous time/analog controller. [4]

b) State and explain the implementation problems in digital control. [4]

c) A discrete-time control system is represented by the difference equation

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

Where k is the sampling instant; $x(k)$ is $n \times 1$ 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 this system? [6]

b) Discuss the method of obtaining equivalent discrete time version of continuous time system

$$\begin{aligned}\dot{x}(t) &= Ax(t) + Bu(t) \\ y(t) &= Cx(t)\end{aligned}\quad [6]$$

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. :

P3002

[Total No. of Pages : 2

[4660]-1156

M.E. (Electrical) (Power System) (Semester - I)
COMPUTER APPLICATIONS IN POWER SYSTEMS
(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 side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) Solve any THREE :

[18]

- a) Maximize $f(X) = 2x_1 + x_2 + 10$ subjected to $g(X) = x_1 + 2x_2 - 3 = 0$.

Use Lagrange's Method.

- b) Minimize $f(X) = 2x_1^2 + x_2^2$ using Univariate Method from starting point $X = [1, 2]^T$. Perform two iterations. Take probe length as $\epsilon = 0.01$.
- c) Explain fast decoupled load flow method with assumptions.
- d) Derive the equation used in three phase load flow analysis.

Q2) Solve any TWO :

[16]

- a) Two units of the system have following cost curves

$$f(P_{G1}) = 0.00889P_{G1}^2 + 10.333P_{G1} + 200 \text{ Rs/h}$$

$$f(P_{G2}) = 0.00741P_{G2}^2 + 10.833P_{G2} + 240 \text{ Rs/h}$$

The transmission loss are given by

$$P_L = 0.001P_{G1}^2 + 0.002P_{G2}^2 - 0.0004P_{G1}P_{G2}$$

Where P_G is in MW. Determine the economic operating schedule to meet the demand of 150 MW using classical method perform one iterations.

P.T.O.

- b) Derive economical load dispatch problem on a bus bar without considering losses.
- c) Explain economical load dispatch using Newton Raphson Method.

Q3) Solve any TWO :

[16]

- a) Derive general formula of fault current and fault voltage for LL type fault.
- b) Show that transmission loss formula is a function of generation and load.
- c) Derive transmission loss coefficient using sensitivity factor.



[4660]-1158

M.E. (Electrical) (Power Systems)

POWER SYSTEM MODELING

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) Solve total three questions. Answer any 1 from Q1 or Q2, Q3 or Q4 and Q5 or Q6 each.
- 2) Assume suitable data if necessary.
- 3) Write down all the assumptions made.

Given $F^{abc} = [P] F^{dq0}$, where Park's transformation

$$[P] = \begin{bmatrix} k_d \cos \theta & k_q \sin \theta & k_o \\ k_d \cos \left(\theta - \frac{2\pi}{3} \right) & k_q \sin \left(\theta - \frac{2\pi}{3} \right) & k_o \\ k_d \cos \left(\theta + \frac{2\pi}{3} \right) & k_q \sin \left(\theta + \frac{2\pi}{3} \right) & k_o \end{bmatrix}$$

(Where, $K_d = K_q = \sqrt{2/3}$ and $K_o = \sqrt{1/3}$)

Q1) A synchronous machine is having one damper winding on d -axis and one damper windings on q -axis. Derive the stator and rotor voltage equations and torque equations in $dq0$ frame of reference for this machine. Write down assumptions involve in it. [18]

P.T.O.

OR

Q2) A round rotor synchronous generator is represented by an EMF behind a synchronous reactance. For this machine governor controls the shaft input power and the excitation system controls the internally generated EMF E_g . A synchronous generator is operating at a lagging power factor with current I_1 , internally generated voltage E_{g1} , and terminal voltage V_t . Assume that the input power is held constant by governor. With these initial operating conditions, assume that the excitation is increased to new value E_{g2} . Assume that the bus voltage is held constant by other machine operating in parallel with this machine. Draw equivalent circuit diagram and with the help of phasor diagram, determine the new value of current I_2 , the new power factor $\cos \Phi_2$, and the new torque angle δ_2 . Also comment on the results for the change in power. [18]

Q3) With the help of equivalent circuit diagram, develop the mathematical model of separately excited dc exciter. Also, draw the block diagram to represent it clearly. [16]

OR

Q4) Discuss the significance of voltage regulator in power system. Explain with the help of suitable block diagram, the working of solid state voltage regulators. [16]

Q5) With the help of the model of synchronous machine, develop the model of an induction motor. Discuss about the assumptions and approximations involved in it. [16]

OR

Q6) What is Static Var Compensators (SVC)? Why it is used in power system? State the basic types of SVCs. Explain the steady state control characteristics of variable impedance type SVC. Also show the effect of inclusion of additional two switchable capacitor banks in it. [16]



Total No. of Questions : 07]

SEAT No. :

P3005

[Total No. of Pages :1

[4660] - 1161
M.E. (Electrical) (Power Systems)
POWER SYSTEM DYNAMICS
(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Solve Total four questions. Answer any Two from Q.1, Q.2 and Q.3. Answer 1 question from Q.4 or Q.5, and Q6 or Q7 each.*
- 2) *Assume suitable data if necessary.*
- 3) *Write down all the assumptions made.*

Q1) A 4 pole synchronous generator rated 100 MVA, 13.8 kV, 60 Hz has inertia constant of 10 MJ/MVA, find **[9]**
a) Stored energy in the rotor at synchronous speed
b) If input of the generator is suddenly increased to 60 MW for an electrical load of 50 MW, find rotor acceleration at the end of 12 cycles.

Q2) Derive stator and rotor equation of synchronous generator represented by model 1.1. Write down assumptions involve in it. **[9]**

Q3) Explain in brief the operation of power system stabilizer (PSS) with the help of neat block diagram. **[9]**

Q4) Derive an equivalent swing equation for three interconnected non coherent machines. The machines are having inertia constants H_1 , H_2 and H_3 , and load angles δ_1 , δ_2 , and δ_3 . Prove that the equation of such case is equivalent to swing equation of single machine connected to infinite bus system. **[16]**

OR

Q5) Derive an expression for small signal analysis of multimachine system considering simplified model of synchronous machine. State any assumption made. **[16]**

Q6) Explain the terms voltage stability and angle stability. Also, explain with the help of appropriate waveforms effect of AVR to analyze it. **[16]**

OR

Q7) a) Explain the terms voltage instability and voltage collapse. Discuss the factors affecting it. **[8]**

b) Explain in detail the necessity and different methods of islanding in power system. **[8]**



Total No. of Questions : 8]

SEAT No. :

P3006

[Total No. of Pages :1

[4660] - 1162

M.E. (Electrical) (Power Systems) (Semester - II)

POWER SYSTEM PLANNING AND RELIABILITY

(2013 Pattern)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Solve total five questions. Answers any two from Q1, Q2 and Q3. Solve Q4 or Q5, and Q6 or Q7. Q8 is compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) Define load forecasting? Explain in detail weather sensitive and reactive load forecasting methods. **[9]**

Q2) What is correlation and regression in context with probability theory? Explain gamma and beta distribution. **[9]**

Q3) Explain recursive technique of reliability evaluation. **[9]**

Q4) What are the objectives of generation planning? Explain various factors affecting generation planning. **[10]**

OR

Q5) Explain generation integrated system and factors affecting interconnection under emergency assistance. **[10]**

Q6) Explain transmission planning and various transmission line constraints. **[10]**

OR

Q7) What are the factors affecting distribution system reliability. Explain various distribution reliability indices. **[10]**

Q8) Explain the following terms in context with distribution system planning and reliability : **[12]**

- a) Network reconfiguration.
- b) Weather effects.
- c) Interruption indices



Total No. of Questions : 05]

SEAT No. :

P3007

[Total No. of Pages :1

[4660] - 1163

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

HVDC AND FLEXIBLE AC TRANSMISSION

(2013 Pattern)

Time : 3 Hours]

[Maximum 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 **[18]**

- a) What are the dc link converter topologies? Discuss the control issues in power converters.
- b) Explain working principle, V – I characteristics & control schemes of SVC.
- c) Comment on 12 pulse converter operation and harmonics in HVDC system.
- d) Explain CEA control for HVDC link with diagram.
- e) Explain the operation of SSSC with help of neat block diagram and control characteristics.
- f) Draw UPFC configuration. What are the operational constraints for UPFC?

Q2) a) Draw & explain different components of HVDC system. **[8]**

b) Comment on HVDC grounding methods. **[8]**

OR

Q3) a) Compare HVDC light and HVDC transmission system. **[8]**

b) Explain the structure of VSC link and explain DC system control in VSC transmission. **[8]**

Q4) a) Explain the principle, operation control and power transfer characteristics of VSC (voltage source converter) of HVDC transmission. **[8]**

b) Explain HVDC protection schemes used against over - voltage. **[8]**

OR

Q5) a) Write short note on multi - terminal HVDC systems configurations. **[8]**

b) Compare VSC HVDC with conventional HVDC. **[8]**



Total No. of Questions : 6]

SEAT No. :

P3008

[Total No. of Pages :1

[4660] - 1165

M.E. (Electrical) (Power System) (Semester - III)

ADVANCED POWER SYSTEM PROTECTION

(2013 Pattern)

Time : 2 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6.
- 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 Least error squared (LES) technique. What is the use of this technique? [9]
- b) Explain digital protection of EHV/UHV transmission line based upon travelling wave phenomenon. [9]

OR

- Q2)** a) Explain digital protection scheme of synchronous generator based upon injection of subsynchronous component in the rotor circuit. [9]
- b) Explain magnetising inrush current phenomenon of transformer. How this is considered in digital protection of transformer? [9]

- Q3)** a) Explain three stepped distance protection. [8]
- b) Explain distance relay setting in detail. [8]

OR

- Q4)** a) Explain co - ordination criteria of directional instantaneous IDMT over current relay for two terminal lines. [10]
- b) Write a note on computer graphics display. [6]

- Q5)** a) Why short circuit studies are important? Explain development of algorithm for the short circuit studies. [10]
- b) With reference to (a) above, explain transformation to symmetrical components? [6]

OR

- Q6)** a) What are the assumptions made for conducting short circuit studies of a power system network? [6]
- b) Explain P.C. based integrated software features for S.C. studies. [10]



Total No. of Questions : 8]

SEAT No. :

P3009

[Total No. of Pages :1

[4660] - 1166

M.E. (Electrical) (Power Systems)

POWER QUALITY ASSESSMENT AND MITIGATION

(2013 Pattern) (Semester - III)

Time : 3 Hours]

[Maximum Marks : 50

Instructions to the candidates:

- 1) *Solve total five questions. Answers any two from Q1, Q2 and Q3. Solve Q4 or Q5, and Q6 or Q7. Q8 is compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) Explain various definitions of power quality with reference to each stake holders and why a power quality is gaining its importance in recent years. [9]

Q2) What are the objectives of grounding? Explain different problems due to poor grounding. [9]

Q3) Explain various devices used for voltage regulation and impact of reactive power management. [9]

Q4) Explain influence of fault location and fault level on voltage sags. [10]

OR

Q5) Explain economic impact of voltage sag and its consequences. [10]

Q6) What are harmonic resonances? Explain consequences of harmonic resonances. [10]

OR

Q7) Explain the basic structure of power quality monitoring system and approaches followed in power quality monitoring. Enlist various equipments used for power quality monitoring. [10]

Q8) Explain following terms in connection with power quality assessment : [12]

- a) Classification of power quality phenomenon as per IEC - 61000-2-5 : 1995
- b) Harmonic measurement using state variable model.



Total No. of Questions : 5]

SEAT No. :

P3010

[Total No. of Pages : 2

[4660] - 1168

M.E. (Electrical) (Power Electronics & Drives)

MODELING AND ANALYSIS OF ELECTRICAL MACHINES

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:-

- 1) *Question No. 5 is compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Draw sketches of basic two-pole machine and respective primitive machine of the following machines: [9]
- i) Synchronous machine
 - ii) Single phase induction motor
- b) State the dynamic model of separately excited dc machine. Write the expression for instantaneous speed of dc motor and hence comment on the transient behavior of motor for various disturbances. [9]

OR

- Q2)** a) Discuss and derive the transformations for currents between a rotating balanced 3-phase winding and a pseudo-stationary 2-phase (d,q) winding. Assume equal turns on all coils. [9]
- b) From the voltage matrix, derive the expression for instantaneous torque of a three phase induction motor. [9]
- Q3)** a) State the impedance matrix for a 3-phase 4-salient pole synchronous machine fitted with amortisseurs. Hence obtain an expression for instantaneous torque. [8]

P.T.O.

- b) The parameters of a 3-phase 50 Hz cylindrical-rotor synchronous machine are:
Armature leakage inductance = 0.25mH
Self-inductance per phase = 115 mH
Calculate the mutual inductance between armature phases and its Synchronous reactance. [8]

OR

- Q4)** a) Discuss the theory on armature mutual inductance of salient pole synchronous machine from a consideration of its basic parameters. [7]
b) Explain how Park's transformations transform equations in (a,b,c) variables to (d,q,o) variables. [9]

Q5) Write the short notes on: [2 × 8 = 16]

- a) The linearised model of Synchronous machine
b) Small displacement stability and Eigen values of typical induction machine.

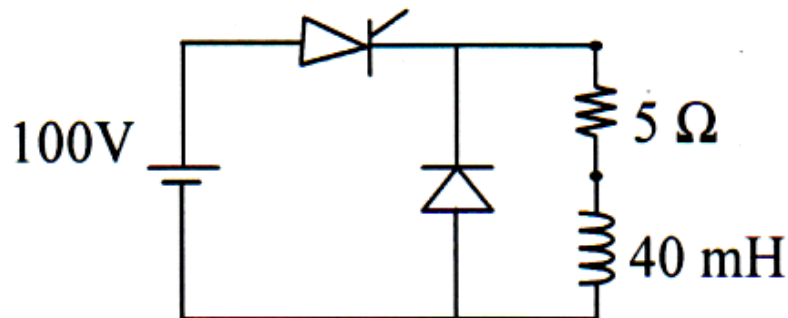


[4660] - 1170

M.E. (Electrical) (Power Electronics & Drives)**POWER CONVERTERS****(2013 Pattern)***Time : 3 Hours]**[Max. Marks : 50**Instructions to the candidates :*

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*

- Q1) a)** A dc chopper circuit connected to a 100 V dc source supplies an inductive load having 40 mH in series with a resistance of 5 ohms. A freewheeling diode is placed across the load. The load current varies between the limits of 10A and 12A. Determine the time ratio of the chopper. [8]



- b) Explain the working of a Three phase fully controlled bridge converter supplying RLE load with a neat diagram and waveform. [10]

OR

- Q2) a)** Write a short note on sinusoidal pulse modulation used for controlling inverter output voltage. [8]
- b) Explain three phase Voltage Source Inverter (180° mode) with necessary waveforms and derive the line-line output voltage equation using Fourier Series. [10]

P.T.O.

- Q3) a)** What are resonant converters? Give the advantages over PWM controlled converters [6]
- b) Describe ZVS resonant converters with appropriate circuit diagram and waveforms. [10]

OR

- Q4) a)** Give advantages and disadvantages of ZVS resonant converters. [6]
- b) Explain voltage source series resonant inverter [10]

- Q5) a)** What are the steps involved in determining the output voltage waveforms of 3 phase bidirectional controllers? [10]
- b) A single phase AC voltage regulator feeds an RL load having an impedance angle of 60° . for the conduction angle of 140° , determine the firing angle and load voltage as a ratio of the supply voltage. [6]

OR

- Q6) a)** Draw the circuit diagram and explain the principle of operation of a 1 phase bridge type cycloconverter. What is the relation between triggering angles of the thyristor of positive and negative converters. [10]
- b) What are the advantages and disadvantages of cyclo-converters? [6]



Total No. of Questions :6]

SEAT No. :

P3013

[Total No. of Pages : 2

[4660] - 1173

M.E. (Electrical) (Power Electronics & Drives)

AC & DC DRIVES

(2013 Pattern)

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*
- 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 two quadrant DC motor drive by field weakening with a suitable detail block diagram. **[9]**

- b) Draw a schematic diagram of slip power recovery scheme for 3 phase induction motor. Explain its working. Also develop equivalent circuit for this scheme. **[9]**

OR

Q2) a) A DC motor is driven from chopper with source voltage of 24 Volt DC at frequency of 1 KHz. Determine the variation of duty cycle required to have a speed variation of 0 to 1 p.u. delivering a constant 2 p.u.load. The motor parameters are as follows- 1 HP, 10 volt, 2500rpm, efficiency =78.5% , Armature resistance =0.01 Ω , inductance of motor = 0.002 H, $k_b = 0.03819$ volt/rad/sec. The chopper is one quadrant and on - state drop voltage across the device is 1 volt irrespective of current variation. **[9]**

- b) State the merits of vector control of induction motor. Explain field oriented control of induction motor. **[9]**

P.T.O.

- Q3)** a) Explain the operation of split phase supply converter controlled permanent magnet brushless DC motor. [8]
- b) Discuss the control circuit and performance characteristics of switched reluctance motor. [8]

OR

- Q4)** a) What is multistack stepper motor ? Discuss performance characteristics of this motor [8]
- b) Explain the driver circuits used for control of brushless DC motor. [8]

- Q5)** a) Derive the transfer function of armature controlled separately excited DC motor. Draw its control system block diagram mentioning the respective details. [8]
- b) Discuss in detail the dynamic modelling of 3 phase induction motor. [8]

OR

- Q6)** a) Derive the transfer function of field controlled separately excited DC motor. Draw its control system diagram including all details. [8]
- b) Discuss dynamic modelling of separately excited DC motor. [8]



Total No. of Questions : 8]

SEAT No. :

P3014

[Total No. of Pages : 1

[4660] - 1174

M.E. (Electrical) (Power Electronics and Drives)

DESIGN OF POWER ELECTRONICS SYSTEMS

(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer all questions.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Use of Calculator is allowed.*
- 4) *Assume suitable data if necessary.*

Q1) Explain mathematical model of IGBT. **[9]**

OR

Q2) Derive the mathematical modeling of Buck Boost converter. **[9]**

Q3) Design a heat sink for a dc-dc Buck system. **[9]**

OR

Q4) Explain design procedure of Inductor with flow chart. **[9]**

Q5) Explain the zero voltage switching technique in a single phase full bridge converter with necessary diagrams and waveforms. **[16]**

OR

Q6) Design the charger for a 12V automotive battery of 450AH capacity in 8 Hrs. **[16]**

Q7) a) What is need of snubber for transistor and explain turn on snubber in detail. **[8]**

b) Why isolation is required in gate circuit? How isolation is obtained in gate drive circuit explain optical isolation **[8]**

OR

Q8) a) Explain different gate drive circuit for Thyristor. **[8]**

b) What are different circuit layout considerations. **[8]**



Total No. of Questions : 4]

SEAT No. :

P3015

[Total No. of Pages : 2

[4660]-1175

M.E. (Electrical) (Power Electronics and Drives) (Semester - II)

ADVANCED CONTROL SYSTEMS

(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.
- 5) Use of electronic calculator is allowed.

Q1) a) Draw diagram and explain state observer. [4]

b) Derive the expression for Matrix - Riccati equation. [5]

OR

c) Consider a plant described by [5]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

and has a performance index

$$J = \int_0^{\infty} (x^T Q x + u^T R u) dt \quad \text{Where } Q = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \text{ and } R = [1]$$

Determine the optimal feedback gain matrix k

Q2) a) Explain types of uncertainties with block diagram. [4]

OR

b) Explain all signal and system norms. [4]

P.T.O.

- c) Define equilibrium point. Also find all equilibrium points for each of the following system. [5]

i) $\dot{x}_1 = -x_1 + x_2$ $\dot{x}_2 = 0.1x_1 - 2x_2 - x_1^2 - 0.1x_1^3$

ii) $\dot{x}_1 = -x_1 + x_2(1 + x_1)$ $\dot{x}_2 = -x_1(1 + x_1)$

- Q3)** a) Define sliding mode control. Prove that the dynamics of the system is independent of the system parameters once it reaches in sliding mode. [5]

- b) Write difference between Variable Structure System and Sliding Mode Control. [5]

c)
$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & 3 & 1 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u + \begin{bmatrix} 0 \\ 0 \\ 0.6\sin(t) \end{bmatrix}$$

Design a sliding surface for the system to get $\xi = 0.8$ and $\omega_n = 5$. [6]

- Q4)** a) Find the transfer function of boost converter. [5]

- b) Describe the control of solar system. [5]

- c) With diagram explain distribution generation in detail. [6]



Total No. of Questions : 6]

SEAT No. :

P3016

[Total No. of Pages : 2

[4660]-1177

M.E. (Electrical) (Power Electronics and Drives) (Semester - III)

POWER ELECTRONICS APPLICATIONS

(2013 Pattern)

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.*
- 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 in allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Explain the need of power flow controllers in power system. **[4]**
- b) Draw the block diagram and explain in brief the operation of wind energy system. **[4]**
- c) Draw the equivalent circuit of bridge rectifier to indicate the effect of commutation overlap on dc voltage magnitude. Write expression for equivalent commutating resistance. **[4]**
- d) What is a Static VAR system? How many types of SVS schemes are present and what are they? **[6]**

OR

- Q2)** a) Explain the role of power electronics in power system. **[4]**
- b) What are the different parameters that have to be considered for synchronizing a distributed system with the grid. **[4]**
- c) What is importance of Harmonics in HVDC-operation? How is characteristic harmonics different from non-characteristic harmonics. **[4]**
- d) Explain the working of TCSC with help of basic schematic diagram. **[6]**

P.T.O.

- Q3)** a) State the advantages of STATCOM over SVC. Draw circuit diagram of single phase STATCOM and explain its steady state control characteristic. [8]
- b) Draw the neat diagram of six pulse STATCOM and describe its steady state performance. [8]

OR

- Q4)** a) Explain working of UPFC with the help of basic schematic diagram. Also state its advantages over STATCOM. [8]
- b) Describe the principle of following controls in UPFC [8]
- i) Control of shunt converter.
 - ii) Control of series converter

- Q5)** a) Draw the schematic diagram of switched mode power supply. Explain the working of each block. [8]
- b) Identify the various voltage disturbances likely to occur in power system operation. How can it be control using uninterruptible power supplies? Explain its working with the help of block diagram. [8]

OR

- Q6)** Describe following power electronics applications using various possible techniques
- a) Induction heating. [4]
 - b) Electric welding. [4]
 - c) Fluorescent lighting. [4]
 - d) Hybrid Vehicle System. [4]



Total No. of Questions : 6]

SEAT No. :

P3221

[4660] - 1178

[Total No. of Pages : 2

**M.E. (Power Electronics & Drives)
POWER ELECTRONICS IN SMART GRID
(2013 Credit pattern) (Semester - III) (603302)**

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) *Assume suitable data, if necessary.*
- 4) *Your are advised to attempt not more than 3 questions.*
- 5) *Your answers will be valued as a whole.*

- Q1)** a) Explain the CDM (Clean Development Mechanism in smart grid). [4]
b) Describe testing of Electromagnetic capability. [4]
c) Discuss reliability issues in high frequency devices used in space applications. [4]
d) Write down integration and interconnection concerns of distributed energy resources. [6]

OR

- Q2)** a) Explain the barriers of implementation of smart grids. [4]
b) Explain the 12 switch HFAC AC-link converter for an induction motor. [6]
c) Write down legal and organizational regulations related to Power quality. [4]
d) Write a short note on distributed energy resources past and future. [4]

- Q3)** a) Describe Home Area Network (HAN) in detail. [8]
b) Explain ZigBee network and its applications. [8]

OR

P.T.O.

- Q4)** a) What is GPS? What are its applications? [8]
b) Write down a note on CLOUD computing. [8]

- Q5)** a) Explain DVR and control strategies of DVR arrangements. [8]
b) Explain operation of D-STATCOM along with decoupled current control method. [8]

OR

- Q6)** a) Explain use of AC/AC voltage regulator for compensation of voltage sag and swell. [8]
b) Explain voltage control scheme used with D-STATCOM. [8]



Total No. of Questions :8]

SEAT No. :

P3361

[4660]-1180

[Total No. of Pages :2

**M.E. (E & TC) (Microwave)
ELECTROMAGNETICS AND ANTENNA THEORY
(2013 Credit Pattern) (Semester - I) (504301)**

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) The magnetic field component of a plane wave in a lossless dielectric is [10]

$$\vec{H} = 30 \sin(2\pi \times 10^8 t - 5x) \hat{a}_z \text{ mA/m and } \mu_r = 1$$

- a) Find ϵ_r .
- b) Calculate the wave length and wave velocity.
- c) Determine the wave impedance.
- d) Determine the polarization of the wave.
- e) Find the corresponding electric field component.
- f) Find the displacement density.

Q2) a) Define the source distribution for the Half Wave dipole and derive the electric field intensity and magnetic field intensity for the same. [5]

b) Compare the following antenna elements qualitatively in terms of their radiation pattern, directivity, power radiated, radiation resistance, effective length. [5]

- i) Hertzian Dipole
- ii) Small Dipole
- iii) Finite length Dipole
- iv) Half-wave Dipole

Q3) a) Draw the geometrical diagram of circular microstrip antenna, enlist its specifications, and explain the design procedure with design equations. [5]

P.T.O.

- b) Explain the procedure for designing Dolph-Tschebyscheff's amplitude distribution and Calculate the array coefficients for $N=5$ and side lobe level to be below 35dB. [5]
- Q4)** a) Explain the Equivalence principle and illustrate its application in aperture antenna analysis with an example. [5]
- b) What is the principle of corner reflector? Explain its salient features. [3]
- c) Find null to null main beam width of 2m paraboloid reflector used at 5GHz. Also find the half power beam width. [2]
- Q5)** a) Explain the feeding methods for microstrip antenna with illustrative diagrams stating the advantages and disadvantages of each. [4]
- b) Derive the array factor for N-element linear array and sketch the radiation pattern for 6 element linear array for the progressive phase shift to be 60° and the distance between the elements is half wave length. [6]
- Q6)** a) Why the spiral antenna is broadband antenna? Explain with relevant mathematical support. [3]
- b) Specify the following dimensions of Yagi Uda Antenna array in terms of wave length: Director length, feeder length, reflector length, reflector feeder spacing and director spacing. [4]
- c) Draw the geometry of V antenna and explain its features, dimensions, advantages, disadvantages and applications. [3]
- Q7)** a) Draw the geometrical diagrams of E-plane, H-plane, Pyramidal, Conical horn antennas, and compare in terms of antenna parameters. [6]
- b) Explain the boundary conditions between conductor - free space, dielectric - free space and dielectric - dielectric and derive these conditions. [4]
- Q8)** a) Derive Wave equation and solve it for free space and explain the significance of attenuation constant, phase constant, intrinsic impedance, phase velocity and group velocity with relevant mathematical expressions. [6]
- b) Explain the detailed analysis of Rectangular aperture and write the E and H fields. [4]

EEE

Total No. of Questions : 6]

SEAT No. :

P3019

[Total No. of Pages : 2

[4660]-1182
M.E. (E&TC) (Microwave)
MICROWAVE MEASUREMENT
(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 electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Explain the characteristic impedance and reflection coefficient for lossless two conductor transmission line. **[4]**
- b) Derive the equation for phase velocity and phase constant for sinusoidal waves of a transmission line. **[6]**
- Q2)** a) Define the cut - off condition and the wave impedance for lossless waveguides. **[2]**
- b) Draw the cross section of Microstrip transmission line and explain. **[4]**
- c) Explain the two - port dence represented by S - parameter matrix with necessary equations. **[4]**
- Q3)** a) What are the sources of uncertainty in RF and microwave measurements. **[4]**
- b) Give any four specification of coaxial connector. **[4]**
- c) State any two applications of "Buffer adaptor". **[2]**

P.T.O.

Q4) a) Name any three methods of measuring attenuation? Explain any one in detail. [5]

b) Explain the important considerations while making attenuation measurements. [5]

Q5) a) Name the different types of noise source and explain any one in detail. [5]

b) Draw the block diagram of a noise figure analyser and explain how the analysis is done. [5]

Q6) a) Draw the block diagram of vector network analyser and explain its working. [5]

b) Explain how the signal analysis is done using spectrum analyser. [5]



Total No. of Questions :8]

SEAT No. :

P3054

[4660]-1185

[Total No. of Pages :2

M.E. (E&TC) (Microwave)
COMPUTATIONAL ELECTROMAGNETICS
(2013 Credit Pattern) (Semester - II) (504307)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Write the paper in single section.*
- 2) *Solve any five questions.*

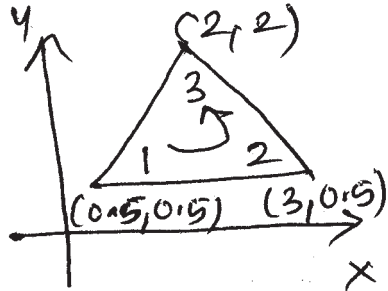
- Q1)** a) Derive Green's function (G) corresponding to PDE for free space. [6]
b) State different errors in numerical solution and explain how they affect the accuracy and stability of FD solution. [4]
- Q2)** a) Write a short note on Green's function. [4]
b) Explain in detail the finite difference analysis for guiding structures. [6]
- Q3)** a) Explain the strength and weaknesses of FDM or FDTD modelling. [4]
b) Explain Yee's FD algorithm. [4]
c) Explain the lattice truncation condition. [2]
- Q4)** a) Explain in detail the various steps in FDM or FDTM. [5]
b) Explain the method of weighted residuals. [5]
- Q5)** a) Explain the Ritz variational method. [5]
b) List the applications of Ritz approach. [2]
c) Compare FEM and MoM. [3]
- Q6)** a) Explain the strength and weaknesses of method of moments. [4]
b) Explain how MoM is used for solution of integral equations with an example. [6]

P.T.O.

Q7) a) Using MoM derive expression for field distribution using integral form of potential equation. [6]

b) Write the difference between FEM and FDM analysis. [4]

Q8) a) The nodal potentials are $V_1 = 100V$, $V_2 = 50V$, $V_3 = 30V$. Determin [6]



i) Potential at (2, 1)

ii) Where 80V equipotential line intersects boundaries of element.

b) State the various computational methods. What is the use of computational methods in electromagnetics? [4]

EEE

Total No. of Questions : 7]

SEAT No. :

P3411

[Total No. of Pages : 2

[4660] - 1186

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

RF AND MMIC TECHNOLOGY

(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.*
- 3) *Assume suitable data wherever necessary.*

Q1) a) Compare HMIC & MMIC. List advantages, disadvantages and applications of MMIC. [5]

b) Enlist the methods for synthesis on non linear MICS. Explain any one in detail. [5]

Q2) a) Explain microstrip couplers and power splitters in detail. [5]

b) What is synthesis of MIC? Explain need of matrix representation for microwave. [5]

Q3) a) Explain via-holes & grounding methods. [5]

b) Explain network matrix decomposition of microwave circuit. [5]

Q4) a) Explain multichip module technology. [5]

b) Explain synthesis of n-port on the base of elementary two port. [5]

P.T.O.

- Q5)** a) Explain complete MMIC design cycle. [5]
b) Write short note on applications of MMICs. [5]
- Q6)** a) Explain CAD package features. List the circuit simulation engines. [5]
b) Explain device and circuit measurement techniques in MMIC. [5]
- Q7)** a) Explain Ga As FET MMIC switches. [5]
b) Write short note on applications of MMICs to : [5]
i) Radio System
ii) Satellite Communication



Total No. of Questions :6]

SEAT No. :

P3362

[4660]-1187

[Total No. of Pages :2

M.E. (E & TC) (Microwave)
WIRELESS COMMUNICATION SYSTEM
(2013 Credit Pattern) (Semester - II) (504309)

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 tables is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Explain different methods for improving coverage and capacity in cellular system. **[4]**

b) Discuss: **[3]**

i) Erlang A formula

ii) Erlang B formula

iii) Erlang C formula

c) Derive the reuse ratio q-factor, beginning from hexagonal cell geometry. **[3]**

Q2) a) Write a short note on free-space attenuation. **[3]**

b) With $h_b = 100\text{ft}$, $h_m = 5\text{ft}$ and frequency of 881.52 MHz ($\lambda = 1.116\text{ft}$). Calculate signal attenuation at a distance equal to 5000ft. Assume antenna gains are 8dB & 0dB for base station and mobile station respectively. What are the free space and reflected surface attenuations. Assume the earth's surface to be flat. **[4]**

c) Explain multiple delay spread, coherence time & coherence bandwidth. **[3]**

P.T.O.

- Q3)** a) Explain architecture of GSM system. [4]
b) Explain the direct spread CDMA principles. [3]
c) Explain data services in GSM. [3]
- Q4)** a) Write short note on RLC protocol in UMTS. [3]
b) Explain MAC layer protocol. [3]
c) Explain wireless network architecture in UMTS. [4]
- Q5)** a) Explain how the use of spectorization helps in reducing the co-channel interference problem. [5]
b) Draw the propagation model for line of sight propagation, derive the power received under this case and explain the each term. [5]
- Q6)** a) Write short note on system features of UMTS. Explain both modes of operation. [5]
b) Draw the architecture diagram of GPRS and explain the function of each element in detail. [5]



Total No. of Questions : 6]

SEAT No. :

P3403

[Total No. of Pages : 2

[4660]-1189
B.E. (E & T/C)
EMI AND EMC TECHNIQUES
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any 5 questions.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if necessary.*
- 5) *Figures to right indicate full marks.*

- Q1)** a) What is EMI and EMC? [2]
- b) What are some basic test categories and their associated requirements? Why should EMI/EMC testing be done at a certified Test Lab? [4]
- c) What do you understand by prediction in transmitter and receiver? With practical examples distinguish conducted, radiated and transient EMI. [4]
- Q2)** a) Give design guidelines for Transmitters, receivers and Antenna systems. [4]
- b) How do you overcome the problem of cross talk in PCB Design. [4]
- c) What is amplitude culling and frequency culling. [2]
- Q3)** a) Explain measurement of Radiated emission and radiation susceptibility with neat diagram. [4]
- b) How you will measure the common mode and differential mode interference voltages. [4]
- c) What are the different types of filters used in EMI for insertion loss. [2]

P.T.O.

- Q4)** a) Distinguish between grounding, shielding and bonding. [5]
b) Explain E-field and H-field shielding effectiveness. [5]
- Q5)** a) Explain design of telephone line filter and its characteristics. [5]
b) State different types of RF absorptive cables. [5]
- Q6)** a) Write short notes on MIL-STD and FCC Regulations. [5]
b) Write short notes on guide lines for EMC design. [5]



Total No. of Questions :8]

SEAT No. :

P3055

[4660]-1190

[Total No. of Pages :2

M.E. (E&TC) (Microwave)
RADAR AND SATELLITE COMMUNICATIONS
(2013 Credit Pattern) (Semester - III) (604302)

Time : 2 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 indicate full marks.*
- 4) Assume suitable data if necessary.*

- Q1)** a) Define the simple form of radar equation. Explain its significance w.r.t S/N ratio. **[4]**
- b) Explain the concept of ray tracing. **[3]**
- c) Radar operates at 10GHz and peak power of 500kW. Its minimum receivable power is 0.1pW. Its antenna has a capture area of 5.0 sq.m and the radar cross section of the target is 20sq.m. Find the maximum range of the radar. **[3]**
- Q2)** a) What is RCS and how it is estimated? Explain with all relevant expressions? **[4]**
- b) What are the techniques RCS Prediction? Explain any one in details. **[3]**
- c) Distinguish between the pulse radar & CW radar. **[3]**
- Q3)** a) Explain the terms related with the radar design: **[5]**
- i) PRF
 - ii) Unambiguous range
 - iii) Velocity
 - iv) Pulse length
- b) Explain the different Antenna beam shapes with suitable diagrams. **[5]**

P.T.O.

- Q4)** a) Explain the concept of radar guidance. [4]
 b) What are the different signals processing methods related with the radar? [3]
 c) Explain in detail the tracking & search radar. [3]
- Q5)** a) Explain the concept of orbital mechanism. [4]
 b) Explain the different steps for launching of artificial Satellite. [3]
 c) Explain the Kepler's law of orbital motion of a body in detail along with related expressions. [3]
- Q6)** a) Explain the concept of orbital perturbation. [4]
 b) What are the different types of satellite as per the altitude? Explain any one in detail. [3]
 c) Explain in detail the TTC & M system in satellite communication. [3]
- Q7)** a) Explain the following multiple access techniques in detail giving illustrations, applications, standards relevance to satellite communications.
 i) FDMA ii) TDMA iii) SS-TDMA [5]
 b) A Satellite at a distance of 6000km from a pilot on the earth's surface radiates a power of 3W from an antenna with a gain of 18dB in the direction of the observer. Find the flux density at the receiving point and the power received by antenna with effective area of 10m². The satellite operates at a frequency of 10GHz. The receiving antenna has a gain of 50dB. Find the received power. [5]
- Q8)** a) Explain the power budget analysis in satellite link with suitable mathematical expressions. [4]
 b) Explain interference in FDMA systems. [3]
 c) Write note on applications and recent trends in satellite systems. [3]

EEE

Total No. of Questions : 8]

SEAT No. :

P3222

[Total No. of Pages : 2

[4660] - 1192

M.E. (E & T/C)(VLSI & Embedded Systems)

DIGITAL CMOS DESIGN

(2013 Credit Pattern) (504201) (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) Use of electronic pocket calculator is allowed.*
- 4) Assume suitable data, if necessary.*

Q1) a) What is technology scaling? What are types? Explore each in brief. **[5]**

b) Draw ac equivalent circuit for MOSFET and give details of capacitances involved. Compare these capacitances w.r.t. regions of operation of MOSFET. **[5]**

Q2) a) Certain CMOS logic operates at 1 GHz with supply of 1 Volt. The output of logic is connected to load of 100 pF through metal wire of length 10 μm . If the capacitance per unit length of wire is 1 pF/ μm , compute power dissipation in the logic. **[5]**

b) Derive the expression for power delay product. How does it help designer? Give an example. **[5]**

Q3) a) What is SPICE? List SPICE model parameters of MOSFET. How are these useful in design? **[4]**

b) Explore any one CMOS fabrication process in brief. **[4]**

c) Draw layout of CMOS inverter. List DRC rules. **[2]**

P.T.O.

- Q4)** a) What are delay estimation techniques? Along with mathematical analysis, explain two of them in brief. [4]
- b) Write note on transistor sizing with suitable example. [4]
- c) What is noise margin? Give expressions. How does it help designer?[2]
- Q5)** a) Design CMOS logic for $Y = A + BC + D(E+F+G+H)$. Compute active area in terms of λ . Comment on area and perimeter of drain/source of any one transistor. [4]
- b) Design one bit latch using transmission gates. Comment on performance.[4]
- c) Compare CMOS NAND & NOR in detail. [2]
- Q6)** a) With the help of schematic, explain dynamic hazards in detail. Explore mitigation techniques. [4]
- b) Draw FSM diagram & write HDL code for overlapped type Mealy 1001 sequence detector. [4]
- c) Define set up & hold time of a flip flop. How to take care of these timings while designing the system? [2]
- Q7)** a) Draw an example of ratioed circuit & explain in brief. What are merits & application areas of ratioed circuits? [4]
- b) With the help of suitable schematic, explain cascade voltage switch logic.[4]
- c) Explain low power design techniques. [2]
- Q8)** a) What is need of dynamic circuits? Draw an example of dynamic circuit & explain. [4]
- b) Draw & explain sense amplifier circuit. What are its applications? [4]
- c) Explain high speed design techniques. [2]



Total No. of Questions : 8]

SEAT No. :

P3223

[4660] - 1194

[Total No. of Pages : 2

M.E. (E & TC -VLSI and Embedded System)

RECONFIGURABLE COMPUTING

(2013 Credit Pattern) (Semester - I) (504203)

Time :3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any 5 questions out of 8.*
- 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 are allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) State and explain reconfigurable device characteristics. [4]
b) Explain delta delay, intrinsic delay, interconnect delay pertaining to RD. [3]
c) Compare various processor architectures with reconfigurable architecture in brief. [3]
- Q2)** a) How would you modify the present multicontext FPGA to convert into RFPGA? Explain in brief. [4]
b) How to calculate instruction bandwidth of LUT based structure? How does that BW make a decision of on/off chip memory? [3]
c) How to compute area on chip per bit PE? Give the expression and Explain. [3]
- Q3)** a) Discuss various reconfigurable devices developed yet. [4]
b) Give the issues in Reconfigurable Network Design. [3]
c) Write short note on Configurable, Programmable, and fixed-Function devices. [3]

P.T.O.

- Q4)** a) Draw and explain architecture of DPGA? [4]
 b) What are the research challenges in the design and development of Reconfigurable devices? [3]
 c) What are the problems with simple networks? Explain in details with example. [3]
- Q5)** a) Explain RP space area model mathematically. [4]
 b) Explain the terms functional density, functional diversity and data density with reference to reconfigurable devices. [3]
 c) What is need of instruction compression? What are its techniques? Which is best suitable for RD? [3]
- Q6)** a) Explain hierarchical interconnects in detail. What are its effects on the performance of the reconfigurable device? [4]
 b) What is Rent Rule? Explain its importance. [3]
 c) Find area required for interconnect a 2500 4-LUT device. Assume minimum wire pitch is 8λ and the crossbar is implemented with two layers of dense metal routed at this minimum wire-pitch. [3]
- Q7)** a) Give the first order comparison of area occupied by different blocks on chip of FPGA. What is conclusion? [5]
 b) Give mathematical analysis of switch, channel and wire growth. [5]
- Q8)** a) What are working RC examples? What tasks are being performed by them? [5]
 b) What is partially reconfigurable? Is it supported in any present device? How do you decide that the task needs fully reconfigurable device? [5]



Total No. of Questions :8]

SEAT No. :

P3057

[4660]-1197

[Total No. of Pages :2

M.E. (E&TC) (VLSI & Embedded Systems)
ANALOG CMOS DESIGN
(2013 Credit Pattern) (Semester - II) (504207)

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) Explain in detail MOS as a active diode and resistor. [4]
b) Write short note on CMOS inverter as an amplifier. [3]
c) Draw and explain single MOSFET current sink. [3]
- Q2)** a) Draw cascade current sink. What are the techniques to improve v_{min} . [4]
b) Justify the necessity of band gap reference. Give the schematic and principle of BGR & conventional BGR. Give the necessary expression. [3]
c) Explain in detail common source amplifier. [3]
- Q3)** a) Draw and explain CMOS OPAMP. [5]
b) Explain the concept of low noise OPAMP. [3]
c) Explain in brief the output amplifier of CMOS OPAMP. [2]
- Q4)** a) Write short note on micro power OPAMP. [5]
b) Write short note on weak inversion, MOS small signal models & short channel regime. [3]
c) Draw and explain differential amplifier. [2]

P.T.O.

- Q5)** a) Explain in detail switched capacitor. [4]
b) Write short note on trends in RF chip design. [4]
c) What are the techniques to improve the bandwidth. [2]
- Q6)** a) Explain the concept of Zero as bandwidth enhancers. [4]
b) Explain in detail open circuit and short circuit method. [4]
c) Write short note on Tuned amplifier. [2]
- Q7)** a) Explain the concept of power constrained noise optimization. [5]
b) Derive the expression for intrinsic MOSFET of two port noise parameter. [5]
- Q8)** a) Explain in detail Low noise amplifier. [5]
b) Explain in detail the LNA topologies. [5]

EEE

Total No. of Questions : 8]

SEAT No. :

P3415

[Total No. of Pages : 2

[4660] - 1198

M.E. (E & TC) (VLSI & Embedded Systems) (Semester - II)

SYSTEM ON CHIP

(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) *All questions carry equal marks.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Explain SOC architecture and discuss the current issues in software/hardware co-design in SOC. **[6]**

b) Draw SDF for PAM and explain its operation of role in SOC. **[4]**

Q2) a) Explain in detail the abstraction levels which are predominantly used in SOC modeling with suitable examples. **[5]**

b) Differentiate how hand shake signals have to be modified/ enhanced for pipelined architectures. **[5]**

Q3) a) Demonstrate in detail the stages of RISC pipeline and list out the advantages over general purpose processors. **[6]**

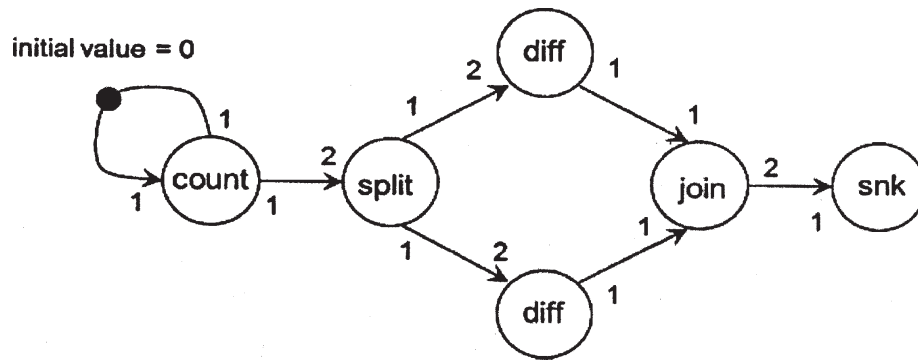
b) Briefly explain about the terms listed below : **[4]**

- i) Simulation Race
- ii) Timing Analysis for Digital circuits
- iii) Switching activity
- iv) Bus synchronization

P.T.O.

- Q4)** a) Elaborate in detail about a SOC Controller for Digital Still Camera. [5]
 b) Explain about Energy Management Techniques for SOC Design. [5]

- Q5)** a) Design the FSM shown below and draw SDF for the design. [6]



- b) Briefly explain about the terms listed below : [4]
 i) SOC prototyping
 ii) SOC verification

- Q6)** a) How clock gating is used to reduce switching rate in SOC. [5]
 b) Discuss a simple start/done handshake to implement hierarchical control of iterative component. [5]

- Q7)** a) Define the factors for instruction set of custom-hardware module depends and provide guidelines for instruction set in context with co-design. [5]
 b) What are components of layout of the coprocessor control shell? [5]

- Q8)** a) In the SOC design architecture list out the Importance of low power, causes and factors affecting power in physical design. [6]
 b) Explain different sequential arcs with examples. [4]



Total No. of Questions :8]

SEAT No. :

P3058

[4660]-1199

[Total No. of Pages :2

M.E. (E&TC) (VLSI & Embedded Systems)
EMBEDDED SIGNAL PROCESSORS
(2013 Credit Pattern) (Semester - II) (504209)

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) *All questions carry equal marks.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Write a note on real-time embedded signal processing. [4]
b) Differentiate between: [3]
i) Time invariant and time variant systems.
ii) Causal and non-causal systems.
c) Discuss linear convolution with a suitable example. [3]
- Q2)** a) Describe correlation and its types. [4]
b) What is zero-padding? Explain its significance. [3]
c) Differentiate between convolution and correlation. [3]
- Q3)** a) Explain linear and non-linear filters with one example each. [4]
b) Describe i) Sampling and ii) Quantization [3]
c) Explain moving average filter. [3]
- Q4)** a) Write a note on Discrete Fourier Transform. [4]
b) Explain FFT. [3]
c) Explain finite word length effects. [3]

P.T.O.

- Q5)** a) What are structures? Explain its types. [5]
b) Discuss the design of FIR filter using any two window functions. [5]
- Q6)** a) Explain IIR filter design methodology. [5]
b) Describe MAC and barrel shifter in DSP processor. [5]
- Q7)** a) Explain the architecture of a DSP processor with a neat diagram. [5]
b) Draw and explain the architecture of a Blackfin processor. [5]
- Q8)** a) Discuss the DSP applications in digital image enhancement. [5]
b) Explain any one adaptive filtering algorithm. [5]

EEE

Total No. of Questions :8]

SEAT No. :

P3059

[4660]-1201

[Total No. of Pages :3

M.E. (E & TC) (VLSI & Embedded Systems)
FAULT TOLERANT SYSTEMS
(2013 Credit Pattern) (Semester - III) (604201)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Assume suitable data if necessary.*
- 3) *Solve any five questions.*

- Q1)** a) What is binary decision diagram? Explain step by step process to draw the binary decision diagram for function $F = \bar{a} b \bar{c} + a c$. [3]
- b) Define unknown logic value. Explain how to construct a truth table for 2 input XOR gate. [3]
- c) Classify and define circuit simulation. Explain with neat diagram the event driven logic simulation method. [4]
- Q2)** a) Construct a primitive cube table for function: [3]
- $$F = \bar{x}_1 \bar{x}_2 + x_1 \bar{x}_2 + \bar{x}_1 x_2 x_3$$
- b) Define and explain in detail with the timing diagram, different delay models w.r.to 2 input AND gate. [4]
- c) Write short note on static and dynamic hazard detection. [3]
- Q3)** a) State Fault Equivalence and Fault Dominance Theorem. For figure 1 determine collapse ratio by applying fault equivalence and fault dominance theorem in detail. [5]

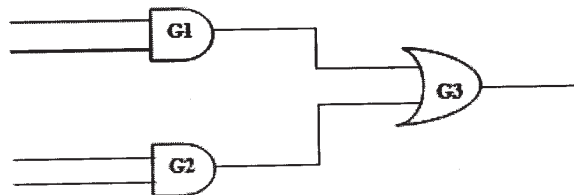


Figure 1

P.T.O.

- b) State Masking Theorem. Prove that fault 'a' s-a-1 masks fault 'c' s-a-0 for the circuit as shown in figure 2. Determine the test vector for the same. [5]

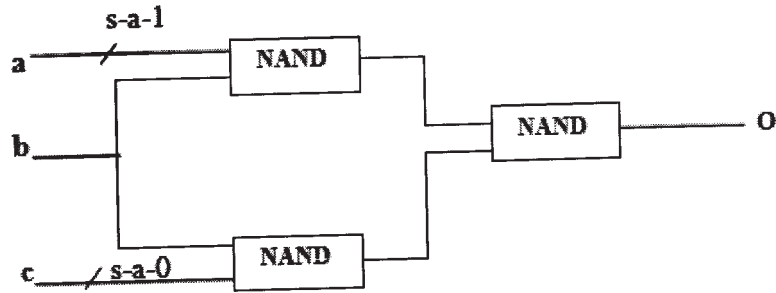


Figure 2

- Q4) a) Explain in detail the Deductive fault simulation algorithm. [4]
 b) Define Detectability. Find test vectors that determine the OR bridging fault between input B & C in fig. 3. shown below. [4]

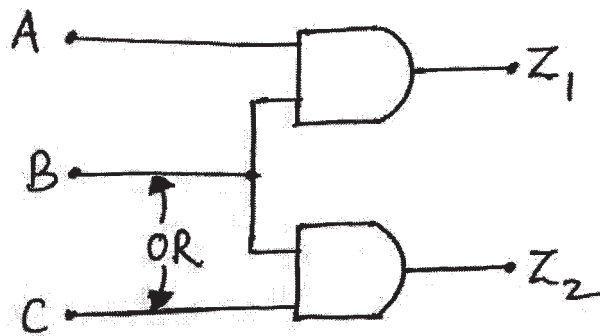


Figure 3

- c) Write short note on Wired logic and Bidirectionality. [2]
- Q5) a) Explain single input signature analyzer to generate the output stream whose reciprocal characteristics polynomial is given by $P(X) = 1 + X^2 + X^4 + X^5$. Assume input sequence as 11110101. [5]
 b) What are the drawbacks of conventional testing approach. Classify different compression techniques. Explain One's count compression technique. [5]
- Q6) a) What is Boundary Scan? Show a design for the boundary-Scan cell circuitry for a Bidirectional I/O pin in the IEEE 1149.1 methodology. [5]
 b) List and explain the different factors for the selection of BIST architecture. [5]

- Q7) a) Explain any two techniques of DFT to increase controllability, observability & predictability. [4]
- b) List out the various functions carried out by BIST controller. Draw and explain with neat diagram the Generic Off-line BIST architecture. [4]
- c) Write a short note on PLA testing. [2]

- Q8) a) Explain fault propagation using D-algorithm for the circuit shown in figure 4. [4]

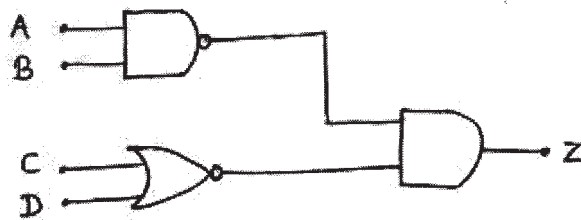


Figure 4

- b) Explain in detail the random testing technique and suppose that the tests $W_1, W_2, W_3, W_4 = 0100, 1010, 0011, 1111$ and 0110 are chosen randomly to test the figure 5. Derive and calculate percentage of single faults detected. [4]

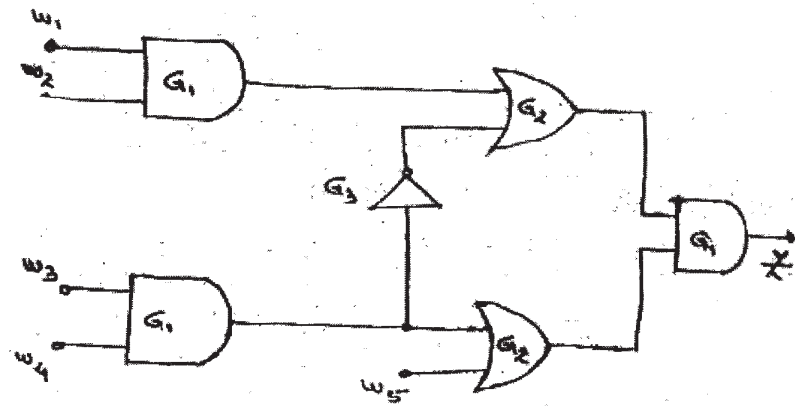


Figure 5

- c) Write short note on ATG systems. [2]

EEE

Total No. of Questions : 8]

SEAT No. :

P3060

[Total No. of Pages :3

[4660]-1202

M.E. (E&TC -VLSI and Embedded Systems)

ASIC DESIGN

(Semester-III) (2013 Credit Pattern) (604202)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions out of 8.*
- 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) Draw the design flow for an ASIC design process and explain each step. **[4]**
- b) Classify and explain in detail gate array based ASIC. **[3]**
- c) What is test bench? Explain with example. **[3]**

- Q2)** a) Explain the terms: **[3]**
- i) Constants
 - ii) Attributes
 - iii) Variables
- b) Explain in brief the combinational and sequential modelling with respect to 4 bit multiplexer and 4bit SISO shift register. **[5]**
- c) Write a short note on static Timing Analysis. **[2]**

- Q3)** a) Explain the terms: **[4]**
- i) Gate level simulation
 - ii) Switch level simulation
 - iii) Transistor level simulation
- b) Explain mixed mode synthesis of ASIC. **[3]**
- c) Write a note on gate level mixed mode testing. **[3]**

P.T.O.

- Q4)** a) Explain the practical aspects of mixed signal analog digital design. [5]
 b) Write in brief about signal integrity effects in ASIC design. [5]
- Q5)** a) Explain with step by step process K-L algorithm for system partitioning. [5]
 b) Differentiate between Global routing and detailed routing. Calculate Elmore constants for node 4 and node 2 for the circuit shown in fig.1.[5]

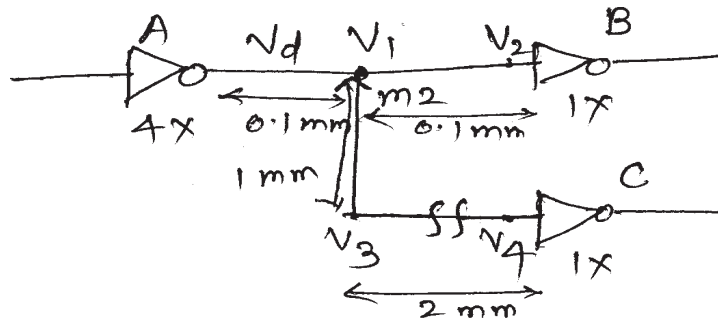


fig. (1)

Given Parameters

- m_2 resistance $50 \text{ m } \Omega/\text{square}$
- m_2 capacitance 0.2 PF/mm
- $4x$ inverter delay is $0.02 \text{ ns} + 0.5 C_L \text{ ns}$
 (C_L is in PF)
- Delay is measured using $0.35/0.65$ output trip points
- m_2 minimum width is $3 \lambda = 0.9 \mu\text{m}$
- $1x$ inverter input capacitance is 0.02 PF

- Q6)** a) List the goals and objectives for ASIC physical design steps. [4]
 b) Explain wrt floorplanning: [3]
 i) Channel capacity
 ii) Channel density
 iii) Channel allocation and ordering
 c) What are the different approaches to global routing? [3]

- Q7) a)** Write short note on any two: **[4]**
- i) Features of EDA tools
 - ii) Issues in verification
 - iii) Testing techniques used in ASIC design.
- b) Briefly describe about boundary scan testing. **[4]**
- c) Define the terms, controllability and observability. **[2]**
- Q8) a)** Explain in detail about ATPG algorithm using test vectors with neat diagram. **[5]**
- b) What is the need of testing and explain with neat diagram the SCAN Path arrangement. **[5]**



Total No. of Questions : 8]

SEAT No. :

P3020

[Total No. of Pages :3

[4660] - 1204

M.E. (Electronics and Telecommunication) (Signal Processing)

IMAGE PROCESSING AND ANALYSIS

(2013 Pattern)

Time : 3 Hours]

[Maximum Marks :50

Instructions to candidates:

- 1) *Attempt any five questions.*
- 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) a) Explain **[5]**

- i) Webber ratio
- ii) Match band effect
- iii) Contrast sensitivity
- iv) Simultaneous contrast

b) Define adjacency and connectivity between pixels. With reference to relation between pixels explain. **[5]**

- i) 4 connectivity
- ii) 8 connectivity
- iii) Mixed connectivity.

Q2) a) With reference to 2D transform explain

- i) Basis function
- ii) Energy compaction
- iii) Orthogonal transform.

How the energy compaction property is useful in image processing technique. **[5]**

b) Explain in detail homomorphic filtering used in image enhancement. **[5]**

P.T.O.

- Q3)** a) Describe image degradation model. Explain the image filtering technique. [4]
- b) Explain the following region based segmentation techniques:
- i) Region growing
 - ii) Region splitting and merging [4]
- c) Discuss local and global thresholding techniques for image segmentation. [2]
- Q4)** a) Explain the morphological opening and closing operations. State two properties of opening and closing. [4]
- b) What is boundary representation? Explain with suitable example how chain codes are used for boundary representation. [4]
- c) What is hit-or-miss transformation? Explain with suitable example. [2]
- Q5)** a) Compare lossy and lossless compression methods. What are the steps involved in compression of an image in sequential JPEG baseline system. [4]
- b) Describe RGB and HSI models for color images [4]
- c) Discuss in brief different redundancies observed in an image. [2]
- Q6)** a) What is principal component Analysis? How it is used in image compression? [4]
- b) What is wavelet transform? How it is used in multiresolution analysis. [4]
- c) What is the concept of sequency in Hadamard transform? [2]
- Q7)** a) Explain following methods of image enhancement in spatial domain [4]
- i) contrast stretching.
 - ii) Log transformation.
- b) Explain in brief how Wiener filter is used for image restoration. [4]
- c) Explain boundary extraction in morphological image processing [2]

- Q8)** a) Explain Hough transform with suitable example. [4]
- b) Explain edge detection technique using sobel mask. What are the problems in edge detection in presence of noise? [4]
- c) Explain the use of Laplacian for enhancement. [2]



[4660]-1206

M.E. (E&T/C) (Signal Processing)

MIXED SIGNAL PROCESSING SYSTEMS AND DESIGN

(Semester-I) (2013 Credit Pattern) (504403)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions out of 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) What are the advantages of Switched Capacitor (SC) circuits on Continuous Time circuits? What are the demerits of Switched Capacitor circuits? [4]
- b) Explain the importance of the two phase, non-overlapping clock scheme and oversampling employed for Switched Capacitor circuits. [4]
- c) Find the value of Capacitor C in a bilinear SC resistor emulation of 10M-ohms, if the clock frequency is 100kHz. [2]
- Q2)** a) Find the values of the capacitor ratios α_1 , α_2 , and α_3 using a 100kHz clock for Fig.1 that will realize the frequency response shown in Fig.2. [5]

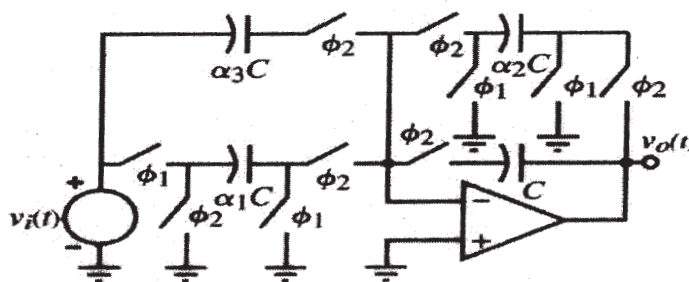


Fig.1

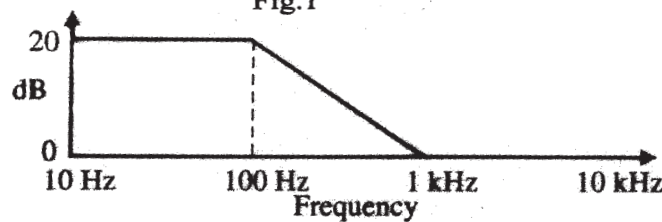


Fig. 2

- b) Describe non-idealities in switched-capacitor circuits due to MOS transistors and operational amplifier. [5]

Q3) a) Draw the schematic of switched capacitor first-order high pass circuit and derive the expression for Z-domain transfer function. [5]

- b) List advantages and disadvantages of switched capacitor circuits. [3]

- c) What are the two port z-domain equivalent of negative and positive SC transresistances. [2]

Q4) a) Use the low-Q SC biquad circuit shown in Fig.3 to design the capacitor ratios of a low pass, second order filter with a pole frequency of 1KHz, $Q=5$ and a gain at dc of -10 if the clock frequency is 100KHz. Find the clock frequency f_c that keeps all capacitor ratios less than 10:1. [5]

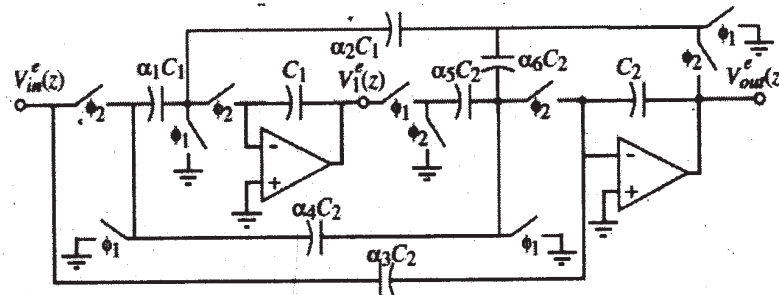


Fig. 3

- b) Design a 3-bit Flash ADC and list the values of the voltages at each resistor tap. Draw the transfer curve for $V_{in} = 0$ to 5V. Assume $V_{ref} = 5V$. [5]

Q5) a) With the help of block diagram, explain successive approximation ADC. Also list its merits and demerits. [5]

- b) If the aperture jitter of the clock in an ADC is 200ps and the input signal is a 1MHz sinusoid with a peak-to-peak value of V_{ref} , what is the number of bits that this ADC can resolve? [3]

- c) A unit MOS capacitor has a tolerance of $\pm 0.5\%$. What are the worst case INL and DNL for an 8-bit binary weighted, charge scaling DAC? [2]

Q6) a) Explain R-2R ladder binary weighted resistor DAC and derive its output voltage in terms of input binary bit sequence and V_{REF} . [5]

b) Determine the INL for the ADC whose transfer curve is illustrated in Fig.4. Assume that $V_{REF} = 5V$. Draw the quantization error, Q_e , in units of LSBs. [3]

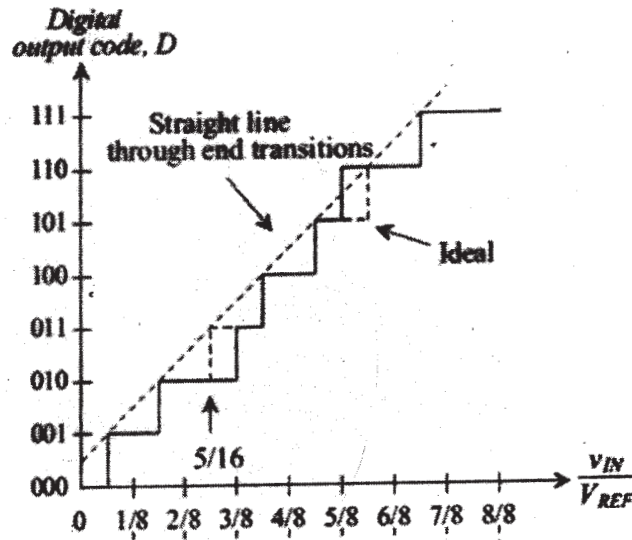


Fig. 4

c) Determine the corresponding output voltage, V_{OUT} for 3-bit DAC designed using an R-2R ladder architecture with $R=1k\Omega$, $R_F=2k\Omega$, and $V_{REF} = 5V$ for inputs $D_2 D_1 D_0=011$ and 111 . [2]

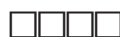
Q7) a) Explain multiphase clock generation using Delay Locked Loop. Support your answer with waveforms. How clock phase errors are handled? [4]

b) Explain the effect of jitter accumulation in DLL and PLL. [3]

c) Explain current-starved VCO with the help of neat diagram. Write expressions for total capacitance and number of stages required. [3]

Q8) a) Explain with the help of block diagram the Direct Digital Frequency Synthesizer. [5]

b) What is the need of locked-in Amplifier? Draw the block diagram of typical locked in amplifier. What is phase sensitive detection and narrow band detection? [5]



Total No. of Questions : 8]

SEAT No. :

P3062

[Total No. of Pages :2

[4660]-1209

M.E. (E& TC) (Signal Processing)

SPEECH SIGNAL PROCESSING

(Semester-II) (2013 Credit Pattern) (504407)

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) Explain the LTV model for speech production. [4]
b) What do you mean by voiced and unvoiced speech? What are the methods used for identifying the voiced and unvoiced part of speech. [3]
c) Explain pitch period measurement using AMDF method. [3]
- Q2)** a) Define Pitch. Explain pitch measurement using Autocorrelation method. [4]
b) What are formants? How are they generated? [2]
c) How are formant frequencies extracted using Cepstral domain analysis. [4]
- Q3)** a) Why is Mel scale important in Speech Processing? Explain the detail block diagram of extracting MFCC from speech. [4]
b) What is Wavelet transform? State its applications in speech processing. [3]
c) Draw and explain single stage Lattice structure for IIR All-pole system realization. [3]
- Q4)** a) What is Forward Linear Prediction? How do we find the forward linear prediction error? [4]
b) State the steps for finding LPC using Autocorrelation method including Levinson-Durbin algorithm. [3]
c) Along with a block diagram, explain Homomorphic processing. [3]

P.T.O.

- Q5)** a) A speech signal has rms amplitude of $4v$. The signal is to be coded using 6 bits. Assume the speech signal having Laplacian Distribution function. Find the quantization noise power and SNR. [4]
- b) Draw block schematic of DPCM encoder and explain. [3]
- c) What is Compander? Explain μ law compander. [3]
- Q6)** a) For the following speech signal samples $x = 0.01, -0.005, 0.1, -0.1$, find mapped o/p y using A law mapping with $A=87.6$ [4]
- b) What is waveform coding? State different types of Waveform Coders. [3]
- c) Write a short note on HMM. [3]
- Q7)** a) Explain VQ-HMM based speech recognition system. [4]
- b) Explain Spectral Subtraction method for Speech Enhancement. [3]
- c) What do you mean by speech morphing? Explain the significance of prosodic features in speech morphing. [3]
- Q8)** a) Draw the block schematic of Echo Canceller and explain. [4]
- b) State the difference between Speaker Identification and Speaker Verification system. Also differentiate between Text Dependent and Independent system. [3]
- c) Explain the basic block diagram of TTS system. [3]



Total No. of Questions : 8]

SEAT No. :

P3063

[Total No. of Pages :2

[4660]-1210

M.E. (E&TC) (Signal Processing)

ARCHITECTURES FOR SIGNAL PROCESSING ALGORITHMS

(Semester-II) (2013 Credit Pattern) (504408)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions out of eight 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) Explain the following properties of Discrete Fourier Transform. **[5]**

- i) Circular Time Shift
- ii) Circular Frequency Shift

b) Using graphical method calculate the circular convolution of the following sequences. **[5]**

$$x_1(n) = \delta(n) + \delta(n-1) - \delta(n-2) - \delta(n-3)$$

$$x_2(n) = \delta(n) - \delta(n-2) - \delta(n-4)$$

Q2) a) Find the output $y(n)$ of an LTI System if impulse response $h(n)=\{1,1,1\}$ and the input signal $x(n)$ is $x(n)=\{3,-1,0,1,3,2,0,1,2,1,\}$ using overlap add and overlap save method. **[5]**

b) Prove that the multiplication of two DFTs of two sequences is equivalent to circular convolution of two sequences in time domain. **[5]**

Q3) a) What is signal flow graph (SFG)? Explain with an example. **[3]**

b) Explain longest path matrix algorithm with an example. **[5]**

c) Explain the steps to construct an equivalent SRDFG into MRDFG. **[2]**

P.T.O.

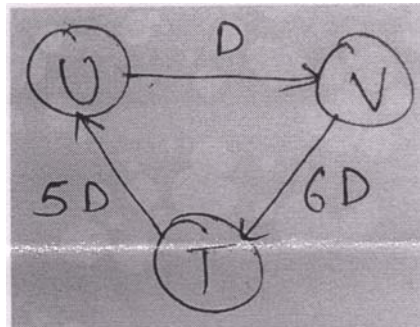
Q4) a) Explain mathematically how pipelining can achieve high speed and low power. [5]

b) Explain systolic array design with an example. [5]

Q5) a) Explain properties of retiming. [4]

b) List the applications of unfolding. Explain any one in detail. [4]

c) Draw 3 unfolded DFG for the given DFG. [2]



Q6) a) Explain implementable bit serial multipliers using systolic mappings. [5]

b) Explain carry free radix-2 addition and subtraction. [2]

c) Explain applications of Folding. [3]

Q7) a) Explain parallel multipliers. Also state the types of it. [5]

b) Explain design of bit serial multipliers using systolic mappings. [5]

Q8) Write a short note on any two of the following. [10]

a) 4×4 carry save Baugh Wooley Multiplier

b) Carry save array multipliers

c) Integrated Convolution algorithm with the merit and demerit of it.

□□□□

Total No. of Questions : 8]

SEAT No. :

P3436

[Total No. of Pages : 2

[4660]-1211

M.E. (E & T/C) (Signal Processing)
BIOMEDICAL SIGNAL PROCESSING
(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates :

- 1) *Answer any five questions out of eight 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) Explain Polarization, depolarization, Repolarization, absolute refractory period, relative refractory period for a Bio Cell. What is the value of Polarization Potential? What is the value of action potential? [5]

b) What do you mean by skin contact impedance and motion artifact? What are the effect of these two while measuring Bio signal? [5]

Q2) a) Draw and explain bipolar limb leads, unipolar augmented limb lead arrangement for Ecg acquisition. [5]

b) Explain various waves observed in EEG with their frequencies and significance. [5]

Q3) a) Draw block diagram of ECG machine and explain working of different blocks? [5]

b) Explain different grounding techniques used in medical instrument. [5]

Q4) a) What is Einthoven's triangle? Explain its significance with neat sketch.[3]

b) Explain the sources of variability in measurement of Biosignal. [2]

c) What is the function of EMG? Enlist the types of EMG and Explain procedure to perform EMG. [5]

P.T.O.

- Q5)** a) Explain Wigner–Ville distribution in brief with suitable equations. [4]
b) Discuss Advantages and disadvantages of FIR and IIR filtering. [2]
c) Explain PCA algorithm with example. [4]
- Q6)** a) Explain the schematic representation of model-based methods of spectral estimation. [4]
b) Consider an IIR filter with feed-forward coefficients {4, 5, 6} and feed-back coefficients {2, 3}. What is the transfer function? Where are the zeros? Where are the poles. [2]
c) Explain how choosing a measure of independence other than variance can lead to a more effective method for separating signals using Independent component Analysis. [4]
- Q7)** a) What is multiresolution (i.e, a wavelet transform having more than one octave)? Demonstrate this idea with a figure. [3]
b) Explain derivative based method for QRS detection. [3]
c) Write a short note on Phonocardiogram. How is recording of PCG signals done. [4]
- Q8)** a) Explain in short functional magnetic resonance imaging (fMRI). [4]
b) Explain the basic principle involved in reconstruction of images from PET, SPECT, and CT. [3]
c) Describe an algorithm to discriminate between normal ECG waveforms and abnormal ECG using radial basis function network. [3]



Total No. of Questions : 8]

SEAT No. :

P3064

[Total No. of Pages :3

[4660]-1213

M.E. (Electronics and Telecommunications)(Signal Processing)

STATISTICAL SIGNAL PROCESSING

(2013 Credit Pattern) (Semester-III) (604401)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any five questions out of eight.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Make suitable assumptions wherever necessary.*

Q1) a) In least Square Method parameters are defined in terms of nonlinear equations. Justify the statement. **[5]**

b) Given the signal $x(n)$ consisting of a single pulse of length N , i.e. **[5]**

$$x(n) = \begin{cases} 1 & n=0, 1, \dots, N-1 \\ 0 & \text{else} \end{cases}$$

Use prony's method to model $x(n)$ as a unit sample response of a linear shift invariant filter having one pole and one zero as,

$$H(z) = \frac{b(0) + b(1)z^{-1}}{1 + a(1)z^{-1}}$$

Q2) a) With the help of suitable block diagram explain Weiner filter application for Noise Cancellation. **[5]**

b) Using Levinson Durbin algorithm find reflection coefficient Γ_j and filter coefficient $a_p(k)$ from the given autocorrelation $r_x(k) = \{1, 0.5, 0.5, 0.25\}$. **[5]**

Q3) a) Consider a first order AR process that is generated by the difference equation $y(n) = ay(n-1) + w(n)$

where $|a| < 1$ & $w(n)$ is a zero mean white noise random process with variance σ_w^2

- i) Find the unit sample response of the filter that generates $y(n)$ from $w(n)$.
- ii) Find autocorrelation of $y(n)$.
- iii) Find power spectrum of $y(n)$ **[5]**

P.T.O.

- b) Bartlett's method is used to estimate the power spectrum of a process from sequence of $N=2000$ sample. [5]
- i) What is the minimum length L that may be used for each sequence, if a resolution $\Delta f=0.005$ is needed.
- ii) Determine the minimum number of data samples N that are necessary to achieve a resolution of $\Delta f=0.005$ and a quality factor that is five times larger than that of periodogram.

- Q4)** a) Find the Pade approximation of second order to a signal $x(n)$ that is given by [5]
 $x = [2, 1, 0, -1, 0, 1, 0, -1, 0, 1, \dots]^T$
 i.e $x(0) = 2, x(1) = 1, x(2) = 0$ and so on. In other words using an approximation of the form

$$H(z) = \frac{b(0) + b(1)z^{-1} + b(2)z^{-2}}{1 + a(1)z^{-1} + a(2)z^{-2}}$$

Find the coefficients $b(0), b(1), b(2)$ and $a(1), a(2)$.

- b) Write LMS algorithm for n^{th} order FIR filter? Also state its convergence property. [5]

- Q5)** a) What is signal modeling? What are two steps in signal modeling? [3]

- b) Implement third order FIR filter $H(z) = 1 + 0.5z^{-1} - 0.1z^{-2} - 0.5z^{-3}$ using Lattice structure and stepdown recursion having the vector coefficient, $a_3 = [1, 0.5, -0.1, -0.5]^T$. [3]

- c) Compare parametric and Nonparametric methods for power spectrum estimation. [4]

- Q6)** a) What are the advantage of lattice filters? [3]

- b) State CR lower bound theorem, and explain with its regularity condition. [3]

- c) Write a short note on channel equalization using adaptive filter. [4]

- Q7)** a) Maximum Likelihood Estimation (MLE) is asymptotically efficient and attains CRLB? Justify. [3]
b) Enlist advantages of NLMS over LMS. [3]
c) Explain the MYWE method for modeling an Autoregressive model AR(p) process. [4]
- Q8)** a) What is Recursive Least Squares? State condition of growing window RLS algorithm. [3]
b) Using spectral factorization method find $H(z)$ for a MA(1) process that has an autocorrelation sequence given by, [3]
$$r_x(k) = 17\delta(k) + 4[\delta(k-1) + \delta(k+1)].$$

c) Schur's recursion is well suited to parallel implementation. Justify. [4]

□□□□

Total No. of Questions : 8]

SEAT No. :

P3065

[Total No. of Pages :2

[4660] - 1214

M.E. (E & TC - Signal Processing)

**STILL IMAGE & MOVING PICTURE COMPRESSION STANDARDS
(604402) (2013 Credit Pattern) (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) *Neat diagrams to be drawn wherever necessary.*
- 4) *Assume Suitable data if required.*

Q1) a) Explain pre-processing block of JPEG - 2000. **[5]**

b) Discuss progressive encoding in JPEG-2000. **[5]**

Q2) a) Explain block based motion estimation & compensation technique.

What are the advantages & disadvantages of this technique. **[5]**

b) Why digital colour videos are converted into Y-Cb-Cr colour space?

What are (4 : 4 :4), (4 : 2 : 2) & (4: 2: 0) Y-Cb-Cr sampling formats? **[5]**
Explain the usefulness of these sampling formats.

Q3) a) Explain interlaced scanning & progressive scanning in analog video. Give their advantages & disadvantages. **[5]**

b) CCIR - 601/625 video is normally digitized at 13.5 MHz sampling rate. Find the number of pixels per scanning line. If there are 720 pixels in the active part of the horizontal scanning, find the duration of horizontal scanning flyback i.e. horizontal blanking interval. **[5]**

Q4) a) Explain salient features of JPEG 2000. **[5]**

b) Explain ROI encoding in JPEG 2000. **[5]**

P.T.O.

- Q5)** a) What is GOP? Explain the GOP structure used in MPEG-1. [5]
 b) Discuss important features of MPEG-2 Give its applications. [5]

- Q6)** a) Explain various scalabilities in MPEG-2. [5]
 b) With suitable diagram explain video bit stream layers in MPEG-1. [5]

- Q7)** a) How coding of motion vector is done in H.263? Explain. [5]
 b) The neighboring motion vectors of the motion vector 'MV' are shown below [5]
- i) Find the median of the neighboring motion vectors.
 - ii) Find the MVD if the motion vector MV is (2.1)

5, -2	4,3	-1,1
3,-3	MV	

Q8) Write short notes on:

- a) H.263 standard [5]
 b) MPEG 4 standard [5]



Total No. of Questions : 8]

SEAT No. :

P3224

[Total No. of Pages : 2

[4660] - 1216

M.E. (Electronics and Telecommunications)

**MODELING & SIMULATION OF COMMUNICATION NETWORK
(2013 Credit Pattern) (504501) (Semester - I)**

Time : 3 Hours]

[Max. 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) State and briefly explain the aspects of various methodologies used for simulations. [5]
- b) What are the parameters for the performance estimation in simulation? [5]
- Q2)** a) Giving the example state the estimation model for band pass signal. [5]
- b) Explain the graphical technique for post-processing. [5]
- Q3)** a) How the mapping of random variable is done for pdf discuss briefly.[5]
- b) How correlated and un-correlated Gaussian random numbers are generated.[3]
- c) Why the numbers are required? [2]
- Q4)** a) How P-N sequence is obtained and state its utility. [4]
- b) State the test for random numbers and discuss one test briefly. [4]
- c) State the various method for random numbers generation. [2]

P.T.O.

- Q5)** a) Explain with an example Monte-Carlo simulation. [4]
b) How the queuing theory supports for network modeling. Explain. [3]
c) State the Poissonian Model. [2]
- Q6)** a) What are the parameters for the performance estimation for a wireless system. [4]
b) What is the need of semi-analytic technique? Justify? [3]
c) Do the number of server system affects the queuing? Justify. [2]
- Q7)** a) What is the effect of non-linearities on modeling and simulations? [4]
b) What is the tap delay model? Explain. [3]
c) What is the importance of sampling method? [2]
- Q8)** a) Distinguish memory and memory-less channel model. [5]
b) Explain the Tail extrapolation. [3]
c) What is the importance of pdf estimator in simulation? [2]



Total No. of Questions : 8]

SEAT No. :

P3427

[Total No. of Pages : 3

[4660]-1218

**M.E. (E & Tc) Communication Network
DETECTION & ESTIMATION THEORY
(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) *Your answers will be valued as a whole.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 6) *Assume suitable data, if necessary.*

- Q1)** a) What is the significance of decision regions in binary hypothesis. [2]
- b) Derive an expression for likelihood ratio using Baye's criterion. [4]
- c) Explain Three cost function used in Bayes estimation to minimize the risk function. [4]
- Q2)** a) In a digital communication system, a source whose output under hypothesis H_1 is a constant voltage of value m_1 while its output under H_0 is m_2 . The received signal is corrupted by N_1 an additive white Gaussian noise of zero mean and variance σ^2 . Set up the likelihood ratio test and determine the decision regions. [5]
- b) A binary communication system transmits polar signals of values $-A$ and $+A$ under hypothesis H_0 and H_1 . The received signal is corrupted by an additive Gaussian noise with zero mean and variance σ^2 . Determine the optimum decision rule for minimum probability of error. [5]

P.T.O.

- Q3)** a) Differentiate between Baye's estimation and maximum likelihood estimation. [2]
- b) Explain in detail criteria's for Good estimators. [4]
- c) The received signal under hypothesis H_1 and H_0 is $H_1: Y_k = m + N_k$ $\therefore k=1,2,\dots,K^1$ and $H_0: Y_k = N_k$ where $k=1,2,\dots,K$. Assuming constant m is not known, obtain maximum likelihood estimate of the mean. [4]

- Q4)** a) Define and classify Random variables. [2]
- b) Describe the properties of Normal distribution. [4]
- c) Consider an experiment of tossing a coin in an infinite number of interval times. A sample function of random Process $x(t)$ is defined as

$$x(t) = \begin{cases} 1 & \text{for } (n-1)T \leq t < nT \text{ if heads at } n^{\text{th}} \text{ toss.} \\ -1 & \text{for } (n-1)T \leq t < nT \text{ if tails at } n^{\text{th}} \text{ toss.} \end{cases}$$

Is the process stationary in wide sense n takes integer values. [4]

- Q5)** a) Explain in detail AR process for estimation of model parameters. [5]
- b) Derive an expression to determine the minimum mean square error using interpolation to estimate $Y(t)$ in the interval $t \in \{0,T\}$ for given $Y(0)$ and $Y(1)$. [5]

- Q6)** a) Classify and explain in brief types of detection in time varying waveforms. [2]
- b) What are different types of wiener filter. Derive an expression for minimum mean square error for optimum unrealizable filter. [4]
- c) Differentiate between forward and backward Linear prediction of stationary random process. [4]

- Q7)** a) Explain in detail the Markov process and markov chains for finite discrete set of values. [4]
- b) A random process $x(t) = A \cos (\omega_0 t + \phi)$ where ϕ is a random variable uniformly distributed over the interval $(0, 2\pi)$ and A & ω_0 are constants. Determine the power spectral density of this process. [4]
- c) Define ergodicity and with the help of Venn diagram brief sets of different classes of processes. [2]
- Q8)** a) Explain the principle of Adaptive CFAR detection. [2]
- b) Explain in detail the significance of eigen values and eigen vectors in applications of signal processing. [4]
- c) The Three possible functions is given by $\phi_k(t) = E \cos \frac{2k\pi t}{T}$, $k = 1, 2, 3$, $0 \leq t \leq T$
Does ϕ_k constitute an orthonormal set? [4]



Total No. of Questions :8]

SEAT No. :

P3225

[4660]-1221

[Total No. of Pages :2

M.E. (E. & T.C) (Communication Network)
TRAFFIC ANALYSIS AND QOS
(2013 Credit Pattern) (Semester - II) (504507)

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 is management information tree? Explain the concept of this. [5]
b) What are the five models in a functional model component of OSI model? Explain each model in detail. [5]
- Q2)** a) Write a short note on managed network, case histories and examples.[4]
b) State various traffic monitoring tools and describe them. What is packet loss and how do you calculate % of packet loss? [3]
c) Why congestion control is difficult in TCP? [3]
- Q3)** a) What is ATM? Also with neat diagram explain virtual circuit configuration. [5]
b) State the reasons for wide usage of TMN framework. [5]
- Q4)** a) Discuss the TMN service management architecture in detail. [5]
b) What are the mechanisms used in ATM traffic control to avoid congestion. [5]
- Q5)** a) Give examples of the requirements of higher speed LANs. [5]
b) Explain in detail the world wide web traffic as self similar data traffic.[5]

P.T.O.

- Q6)** a) Discuss Integrated Services Architecture. [4]
b) Compare the data rate and speed of fast Ethernet with gigabyte Ethernet. [3]
c) Draw the MPLS label format. [3]
- Q7)** a) What are the functions provided by ISA to manage congestion and QOS transport. [5]
b) List the various retransmission strategies in the implementation of TCP. [5]
- Q8)** a) Discuss the issues of fairness, QOS & reservation in traffic management. [4]
b) List the congestion control mechanism in packet switching network. [4]
c) Write a note on congestion control techniques. [2]



Total No. of Questions : 8]

SEAT No. :

P3066

[Total No. of Pages :2

[4660] - 1222

**M.E (E & TC) (Communication Network)
BROADBAND WIRELESS TECHNOLOGIES
(2013 Credit Pattern) (504508) (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 logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) What is OFDM? Explain how orthogonality is achieved in OFDM system. Also briefly explain OFDM system with a neat block diagram stating any one application. **[5]**

b) What is cyclic prefix - based code-Division Multiplex Access system? What are its advantage over OFDM system? State any one application of CP based CDMA. **[5]**

Q2) a) What is space - time coding? What are its advantages? Explain Alamouti codes and its properties. **[5]**

b) Explain MIMO Antenna system with respect to channel capacity, diversity & spatial multiplexing gain. Also state any one application in which MIMO Antenna systems are used. **[5]**

Q3) a) Compare and contrast Time hopping UWB and Direct sequence UWB. **[5]**

b) Compare polling MAC and Reservation MAC, with examples. **[5]**

P.T.O.

- Q4)** a) Explain the different schemes used for Directional Antenna MAC. [5]
b) Explain how Carrier Sense Multiple Access with collision avoidance MAC works? [5]
- Q5)** a) What is the importance of routing protocols in multihop networks? Compare Adaptive Routing Protocol and Scalable Routing Protocol. [5]
b) Explain Hop count and Cumulative Round Trip time with reference to Routing Matrices. [5]
- Q6)** a) What is a Wi-MAX Mesh? Where it can be used? Discuss the general properties of Wi-MAX Mesh, Networks. [5]
b) Describe centralised bandwidth scheduling and distributed bandwidth scheduling in Wi-MAX Mesh networks. [5]
- Q7)** a) Explain how Quality of service is implemented for upstream and downstream in Ethernet Passive Optical Networks. [5]
b) Explain how Bandwidth is managed for Multichannel Ethernet Passive Optical Networks. [5]
- Q8)** a) Explain the design and operation issues related to Ethernet Passive Optical Networks and WiMAX. [5]
b) What are the advantages of Wireless-Optical Broad Access Network (WOBAN) over the wired optical and wireless networks? [5]



Total No. of Questions : 8]

SEAT No. :

P3227

[Total No. of Pages : 2

[4660]-1225

M.E. (E. & T.C.) (Communication Network)

MOBILE COMPUTING

(604501) (2013 Credit Pattern) (Semester-III)

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) What are the functional differences in various generation of mobile computing? [5]
b) Explain various characteristics of mobile computing environment. [5]
- Q2)** a) Discuss the various aspects of 3G mobile technology. [5]
b) Write a short note on: 802.11 frame work. [5]
- Q3)** a) Explain in detail the concept of WLL. [4]
b) How can IP help to transport multimedia data? [4]
c) Draw 4G LTE network architecture. [2]
- Q4)** a) Discuss the design issues in Personal wireless system. [4]
b) Explain the GPRS architecture in details. [4]
c) Write a short note on: Wi-Max technology. [2]
- Q5)** a) Compare the performance and parameters for LAN & wireless LAN. [4]
b) Differentiate 1G & 2G mobile technology. [4]
c) Write a short note on: VOIP architecture. [2]

P.T.O.

- Q6)** a) What is H. 323? Explain in details? [4]
b) How do you performing handoff during roaming? [4]
c) Write a short note on: MIMO. [2]
- Q7)** a) What are the fundamentals of wireless markup language script application? [4]
b) Explain the features of GSM in details. [4]
c) Write a short note on: Bluetooth architecture. [2]
- Q8)** a) Explain the authentication & security related issues in GSM. [4]
b) Explain dynamic channel allocation. [4]
c) Write a short note on: CDMA. [2]



Total No. of Questions : 8]

SEAT No. :

P3228

[4660] - 1226

[Total No. of Pages : 3

**M.E. (E &TC) (Communication Networks)
DIGITAL COMMUNICATION RECEIVERS
(2013 Credit Pattern) (Semester - III) (604502)**

Time :3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any 5 Questions out of 8.*
- 2) *Neat diagrams and waveforms 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 correlative coding? For input binary data 0010111 obtain the output of precoder in a duo binary signaling and also the output of decoder. Consider the first bit of Sequence to be a startup digit, not part of the data. **[5]**

b) Explain the various PCM waveforms for the binary data 10110001. **[5]**

Q2) a) Explain the following with reference to the digital modulation. **[4]**

i) BPSK

ii) MSK

iii) QPSK

b) Determine a set of orthonormal functions for the four signals as given below. The signal $S_1(t)$ has energy $\epsilon_1 = 2$. **[4]**

$$S_1(t) = 1 \quad 0 \leq t \leq 2 \\ = 0 \quad \text{otherwise}$$

$$S_2(t) = 1 \quad 0 \leq t \leq 1 \\ = -1 \quad 1 \leq t \leq 2 \\ = 0 \quad \text{otherwise}$$

P.T.O.

$$\begin{aligned}
 S_3(t) &= 1 & 0 \leq t \leq 2 \\
 &= -1 & 2 \leq t \leq 3 \\
 &= 0 & \text{otherwise}
 \end{aligned}$$

$$\begin{aligned}
 S_4(t) &= -1 & 0 \leq t \leq 3 \\
 &= 0 & \text{otherwise}
 \end{aligned}$$

- c) Explain following non linear modulation methods with memory [2]
- i) CPFSK
 - ii) CPM

- Q3)** a) Derive the expression for maximum output SNR of matched filter. [4]
- b) State the various properties of matched filter. Explain impulse response in detail. [4]
- c) Explain MAP criterion and ML criterion in optimum detector. [2]

- Q4)** a) Explain how the Probability of Error is reduced by using Envelope detection for Correlated binary signal. [4]
- b) A matched filter has the frequency response [4]

$$H(f) = (1 - e^{-j2\pi fT}) / j2\pi f$$

Determine the impulse response $h(t)$ corresponding to $H(f)$.

- c) Describe in brief the Optimum demodulation & Detection for CPM signal. [2]

- Q5)** a) What are the statistical models for Multipath fading channels? Explain them. [4]
- b) Consider the transmitter which radiates a sinusoidal carrier frequency of 1850 MHz. For a vehicle moving 60mph, compute the received carrier frequency if the mobile is moving [4]

- i) directly towards the transmitter
 - ii) directly away from the transmitter
 - iii) in a direction which is perpendicular to the direction of the arrival of the transmitted signal.
- c) What is Doppler shift? [2]
- Q6)** a) What is small scale fading? Explain the factors influencing small scale fading. [5]
- b) What is Frequency selective fading channel? Explain modeling of same. [5]
- Q7)** a) Describe adaptive decision feedback equalizer. [4]
- b) Describe different types of symbol synchronization techniques. [4]
- c) Draw the adaptive Zero forcing Equalizer. [2]
- Q8)** a) Explain Maximum Likelihood timing estimation of base band PAM signal. [4]
- b) Explain Early-Late Gate synchronizer. [4]
- c) What do you mean by self recovering (Blind) Equalization? [2]



[4660]-1228

M.E. (Electronics) (Digital Systems)
MICROELECTRONICS
(504101) (2013 Credit Pattern) (Semester-I)

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.

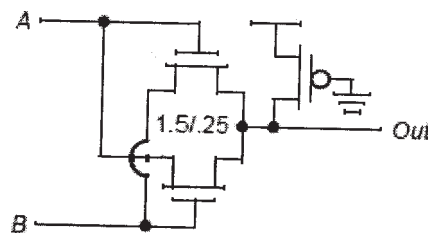
Q1) a) Design CMOS logic gates for the following functions: **[5]**

- a. $Z = \sim(A.B.C.D)$
- b. $Z = \sim(A+B+C+D)$
- c. $Z = \sim(((A.B.C)+D))$
- d. $Z = \sim((((A.B)+C).D))$
- e. $Z = \sim((A.B)+C.(A+B))$

Note: $\sim(a)$ or $\sim a$ is the logical NOT of a.

b) Figure below contains a pass-gate logic network. **[5]**

- i) Determine the truth table for the circuit. What logic function does it implement?
- ii) If the PMOS were removed, would the circuit still function correctly? Does the PMOS transistor serve any useful purpose?



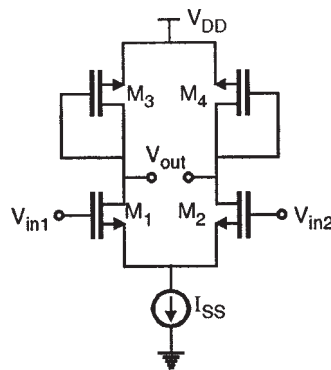
- Q2) a)** Implement following circuits using transmission gates
- (i) 2:1 multiplexer (ii) 4:1 multiplexer (iii) XOR gate
 (iv) OR gate. (v) AND gate. [5]
- b) Calculate approximate dynamic and short circuit power dissipation in a chip operating with V_{DD} of 5 V at 100 MHz with an internal switched capacitance of 300 pF (the average rise/fall time is 200 pS) How does the short circuit power dissipation change if the average rise/fall time is 500 Ps. [5]
- Q3) a)** Design a Half adder using: [4]
- i) Static CMOS logic.
 ii) Pass transistor logic.
 iii) Pseudo NMOS logic.
 iv) Dynamic CMOS logic.
- b) Design a 2:1 multiplexer
- i) Using a combination of CMOS switches and logic gates.
 ii) Using only CMOS logic gates.
- Assess the efficiency of each implementation by counting the total number of switches used in each implementation. Which is more efficient? Why? [4]
- c) Implement two input XOR gate in pass transistor logic. List drawbacks of pass transistor logic. [2]
- Q4) a)** Explain layout design rules with reference to any process technology used in IC fabrication. Draw the stick diagram for [4]
- i) Two input OR gate.
 ii) Two input NOR gate.
- b) What do you mean by dynamic CMOS logic? Implement the following Boolean equation in dynamic CMOS logic and conventional static CMOS logic: $Y = \overline{A(B+C)+DE}$. Compare the two circuits with respect to speed and area. [4]
- c) Compare TTL, CMOS and Bi-CMOS families based on speed, Size and power dissipation. [2]

Q5) a) What is the necessity of MOS diode/active resistor? Draw the MOS diode/active resistor circuits for NMOS and PMOS transistors. Is there any difference in gain of the following amplifier circuits, [4]

- i) Common source amplifier with NMOS diode connected load
- ii) Common source amplifier with PMOS diode connected load

Justify your answer with the suitable circuit diagrams.

b) Determine the voltage gain of the circuit shown in Fig. Assume $\lambda \neq 0$. Assume M_1 is identical to M_2 and M_3 is identical to M_4 . [4]



c) Explain how CMOS inverter can be used as amplifier. [2]

Q6) a) What are the components that account for the power dissipation in a CMOS VLSI Circuit? Calculate approximate dynamic power dissipation in a chip operating with V_{DD} of 5 V at 200 MHz with an internal switched capacitance of 500 pF. [4]

b) What do you mean by photolithography? List and explain various lithography techniques used in CMOS Integrated circuit fabrication process. [4]

c) Draw CMOS inverter circuit and describe its switching characteristics with the help of RC Model. [2]

Q7) a) What do you mean by scaling in CMOS VLSI circuits? Classify various scaling techniques. For a constant field scaling, with scaling factor a , derive the scaled value for power dissipation and area. [4]

- b) Draw and explain fabrication steps following processes: [4]
- i) n-well process.
 - ii) p-well process.
- c) Draw and explain following CMOS circuits: [2]
- i) Switched Capacitors,
 - ii) DAC.
- Q8)** a) Write short notes on following (Any Two): [4]
- i) CMOS RF Circuits.
 - ii) Cross Talk.
 - iii) Non-Idealities in MOSFET.
- b) What do you mean by transistor sizing? What is the impact of transistor sizing on voltage transfer characteristics of CMOS inverter. [4]
- c) Draw and explain pull up and pull down networks CMOS Inverter. [2]



Total No. of Questions : 8]

SEAT No. :

P3023

[Total No. of Pages :2

[4660] - 1230

M.E. (Electronics) (Digital System) (Semester - I)

EMBEDDED SYSTEM DESIGN

(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) *All questions carry equal marks.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Explain following design metrics of embedded system with example. [4]

- i) Time to market
- ii) NRE cost and unit cost.

b) Enlist any four development tools used in embedded system with their purpose. [4]

c) What is requirement engineering? [2]

Q2) a) Explain waterfall model of embedded system with suitable diagram. [4]

b) Explain processor technologies used for embedded systems. [4]

c) Differentiate between system specification and system requirements. [2]

Q3) a) How ARM architecture supports for high level language programming? [5]

b) Explain JTAG boundary scan organisation. [5]

P.T.O.

- Q4)** a) What is concept of Memory Hierarchy? Explain role of Cache design. **[5]**
b) Which are the communication Protocol Supported by ARM? **[5]**
- Q5)** a) What is significance and role of different Linux utilities? **[4]**
b) What is the role of Bootloader? Explain the process of Bootloading. **[3]**
c) Define Embedded Linux? And what are its features. **[3]**
- Q6)** a) Explain Embedded Linux kernel initialization sequence. **[4]**
b) Explain device driver with an example of LCD. **[3]**
c) Explain Embedded Linux Development setup with suitable block diagram. **[3]**
- Q7)** a) Draw and explain Android architecture. **[4]**
b) Explain API and Content providers with reference to android. **[3]**
c) Write short note on network services with reference to android. **[3]**
- Q8)** a) What different features of Android makes it suitable for mobile application? **[4]**
b) With suitable example explain manifest file structure. **[3]**
c) List the steps involved in Android application development. **[3]**



Total No. of Questions : 8]

SEAT No. :

P3024

[Total No. of Pages :2

[4660] - 1231
M.E. (Electronics) (Digital System)
RESEARCH METHODOLOGY
(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Maximum Marks :50

Instructions to the candidates:

- 1) *Attempt any five questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if necessary.*

Q1) a) What do you mean by Research? Explain its components. **[5]**

b) What is research problem? Define the main issues which should receive the attention of the researcher in formulating the research problem. Explain with suitable example. **[5]**

Q2) a) Differentiate Research and Scientific method with suitable examples. **[3]**

b) How will you differentiate between descriptive statistics and inferential statistics? **[3]**

c) “Interpretation is a fundamental component of research process”, Justify why so? **[4]**

Q3) a) Discuss the Moments and response curve methods by giving suitable examples. **[5]**

b) What is the role of Basic instrumentation, DSP and Digital computer system in research process? **[5]**

Q4) a) What is regression analysis? Explain it with a suitable example. **[5]**

b) Define principle component analysis and explain the steps usually involved in Principal Component method. **[5]**

P.T.O.

- Q5)** a) Name the important multivariate techniques and explain the important characteristic of any one of such techniques. [5]
- b) Explain the technique and importance of oral presentation of research findings. Is only oral presentation sufficient? If not, why? [5]
- Q6)** a) Which points to be considered while writing any research proposal?[4]
- b) Explain the characteristics of a good research report. [3]
- c) Describe in brief Literature Survey and its importance in context of research. [3]
- Q7)** a) Mention the different types of report, particularly pointing out the difference between a technical report and a popular report. [4]
- b) Explain the Multiscale modeling. [3]
- c) What is Primary Data? Explain any one method of collecting primary data using modern tools. [3]
- Q8)** Write short note on the following:
- a) Objectives of Research. [3]
- b) State vector machine and uncertainty analysis. [4]
- c) Data collection using digital computer system. [3]



Total No. of Questions : 8]

SEAT No. :

P3365

[Total No. of Pages : 3

[4660] - 1233

M.E (Electronics) (Digital System)

DESIGN FOR TESTABILITY

(2013 Credit Pattern) (504107)

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) Derive the state diagram and write VHDL code that has an input W and an output Z. The machine has to generate $Z = 1$ when the previous four values of W were 1001 or 1111; otherwise $Z = 0$. Overlapping input patterns are allowed. The desired behavior is as follows: **[5]**

W : 010111100110011111

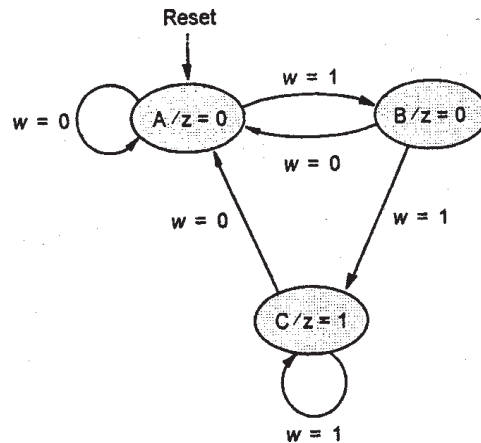
Z : 000000100100010011

b) For the function $f(w_1, w_2, w_3) = \sum m(0,2,3,6)$, use Shannon's expansion to derive an implementation using 2-to-1 multiplexer any other necessary gates. **[5]**

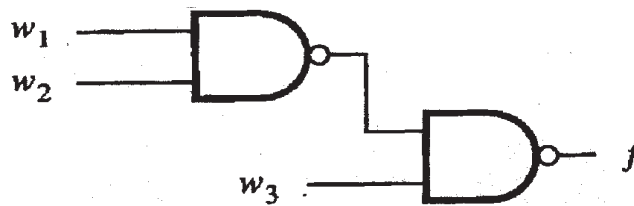
Q2) a) Design a single-input and single-output Moore-type FSM that produces an output of 1 if in the input sequence it detects either 110 or 101 patterns. Overlapping sequences should be detected. **[5]**

P.T.O.

- b) Give the state table, ASM Chart and VHDL program for the state diagram shown in following Fig. [5]



- Q3) a) Derive a table to show the coverage of various stuck-at-0 and stuck-at-1 faults by the eight possible tests. Find a minimal test set for this circuit. [5]



- b) Derive a Mealy-type FSM that can act as a sequence detector that produces $z = 1$ when the previous two values of w were 00 or 11; otherwise $z = 0$. [5]

- Q4) a) Consider the Function $f = \overline{w_1} \overline{w_2} + \overline{w_2} \overline{w_3} + w_1 w_2 w_3$. Give a circuit that implements f using the minimal number of two input LUTs. Show the truth table implemented inside each LUT. [5]

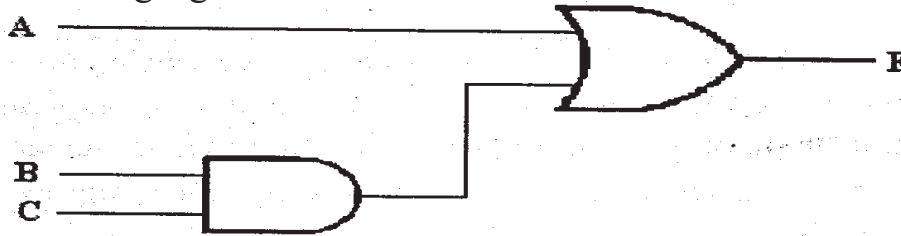
- b) Write VHDL code to expand 8-to-1 multiplexer using component 2-to-1 multiplexer. [5]

- Q5) a) Give the Pseudo-Code for the bit counter. Draw and explain the ASM chart and data path for ASM chart for a bit-counting circuit. [5]

- b) Explain the BIST architecture for sequential circuit. [5]

Q6) a) Explain the working of SRAM Cell. [5]

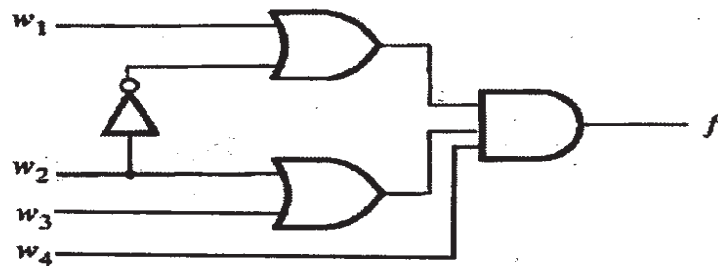
b) Find test set that will detect all possible faults in the circuit shown in following Fig. [5]



Q7) a) Implement the function $f = W_1 W_3 + W_1 W_2 + W_1 W_3$ using Shanon's expansion method with 4 : 1 multiplexer. [5]

b) Explain the steps involved in Scan Path Technique. [5]

Q8) a) For the circuit shown in following Fig. sensitize each path in this circuit to obtain complete test set that comprises a minimum number of tests. [5]



b) Explain the various types of fault models. [5]



Total No. of Questions : 8]

SEAT No. :

P3414

[Total No. of Pages : 2

[4660] - 1234

M.E. (Electronics) (Digital System) (Semester - II)

PLDs AND ASIC DESIGN

(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Your are advised to attempt not more than 5 questions.*
- 3) *Assume suitable data, if necessary.*

Q1) a) Explain need of boundary scan with capture and update mode of operation. [4]

b) Classify types of ASIC. Explain in detail Gate - Array based ASIC's. [4]

c) Describe the significance of IP cores. [2]

Q2) a) Explain in detail with neat block diagram a design flow of ASIC. [4]

b) With step by step process, explain design and development of serial-in/Serial-out converter. [4]

c) List out features of ASIC design EDA tools which are more significant. [2]

Q3) a) Explain the need of Bus function models and describe the working of BFM simulation in detail. [5]

b) Describe and draw Xilinx Virtex - II architecture in brief. [5]

Q4) a) Write a short note on static timing analysis in routing architecture. [5]

b) Explain with Block diagram a chip scope prosystem to test and analyse target device under test. [5]

P.T.O.

- Q5)** a) List out difference between FPGA and CPLD. [2]
b) With neat diagram explain different blocks of PLD XC 9500 architecture. [4]
c) Explain in detail Behavioural, Data flow and structural VHDL modelling techniques. [4]
- Q6)** a) Write a VHDL code of 4 bit shift register in SIPO mode. [4]
b) Classify and explain different types of test benches. Write a VHDL test bench for 2 bit synchronous counter. [4]
c) Classify and explain the need of delay models. [2]
- Q7)** a) Classify and explain in brief state diagram optimization techniques for design. [4]
b) Explain starting state and power on Reset issues in FSM and the techniques to avoid. [4]
c) Explain the Hardware-Software Co-design. [2]
- Q8)** a) Explain the significance of fault tolerance in PLDs and ASIC Design. [4]
b) List out significant factors taken care in designing SOC. [4]
b) Explain the principle and operation of Pipelining in system Design. [2]



Total No. of Questions : 8]

SEAT No. :

P3435

[Total No. of Pages : 3

[4660] - 1235
M.E. (Electronics) (Digital System)
RANDOM SIGNALS AND PROCESS
(2013 Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:-

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

Q1) a) State and explain Bayes Theorem. **[5]**

b) A random variable has an exponential PDF given by $f(x) = ae^{-bx}$, where a and b are some constants. Obtain : **[5]**

- i) relationship between a and b
- ii) distribution function of x for $X > 0$

Q2) a) Define Four properties of joint density function. **[5]**

b) The joint probability density function of two random variables X and Y is given by **[5]**

$$f(x, y) = \begin{cases} K(x^2 + 2y); & \text{for } x = 0, 1, 2 \text{ and } y = 1, 2, 3, 4 \\ 0; & \text{otherwise} \end{cases}$$

Determine :

- i) K
- ii) $p(X \leq 1, Y \geq 2)$

P.T.O.

Q3) a) Define: [5]

i) Random process

ii) Ergodic process

b) Show that the random process $x(t) = A \cos(W.t + \theta)$ is WSS. [A and W are constants and phase shift θ is uniformly distributed random variable on interval $(0, 2\pi)$]. [5]

Q4) a) Explain in detail Cramer – Rao inequality condition. [5]

b) Compare MMSE and MAP, estimations with respect to accuracy and complexity. [5]

Q5) a) Consider θ is uniformly distributed on $[0,1]$ and that observation vector is $Y = \theta + n$, where n is a random variable independent of θ , with exponential pdf $P_n(n) = e^{-n} / n \geq 0$. Find $\hat{\theta}_{\text{MAP}}$ estimate. [5]

b) Write a note on central limit theorem. [5]

Q6) a) If Rayleigh distribution function is defined as [5]

$$f(x) = \begin{cases} \frac{x}{a^2} e^{-\frac{x^2}{2a^2}}; & 0 \leq x \leq \infty \\ 0 & ; a > 0 \end{cases} \quad \text{then calculate :}$$

i) maximum value of this function

ii) mean and standard deviation

b) Describe three important properties of auto correlation function. [3]

c) What is a need of an estimator? [2]

Q7) a) For a stationary ergodic process has auto correlation function [5]

$$R_{xx}(\tau) = 16 + \frac{4}{(1 + 4\tau^2)}. \text{ Process has no periodic components.}$$

Find mean and variance for this process.

b) Explain binary hypothesis test principle. [5]

Q8) a) Using Binomial distribution find the probability of 4 to 7 heads inclusive in 10 tosses of a fair coin. [3]

b) Prove that $E(cX) = cE(X)$, where c is constant. [3]

c) Write a note on Neyman - Pearson test. [4]



Total No. of Questions : 8]

SEAT No. :

P3025

[Total No. of Pages : 3

[4660] - 1237

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 five questions out of eight questions.
- 2) Figure to the right indicates full marks.
- 3) Assume suitable data if necessary.

Q1) a) Explain in detail the MTF for human vision? [5]

b) Explain the following terms. [5]

- i) Weber Ratio
- ii) Match band effect.
- iii) Contrast Sensitivity.
- iv) Simultaneous Contrast

Q2) a) Explain different types of histogram equalization techniques. [5]

b) Find the output of the given below image $f(x,y)$ using CLAHE method. [5]

$f(x,y) =$

0	5	5	6	6	7
2	1	7	7	6	6
4	3	4	5	5	5
5	5	5	7	6	6
5	5	4	6	6	7
5	5	6	6	7	7

P.T.O.

- Q3) a)** Apply 3×3 mean filter and median filter to the image $f(m,n)$ and find the output. Also write the comments on the results. [6]

$f(m,n) =$

10	10	10	9	9
10	10	10	10	10
10	12	100	11	11
10	10	10	10	10
10	12	12	12	11

- b) What is image thresholding? Explain local, global & adaptive thresholding. Give algorithm which can find threshold automatically [4]

- Q4) a)** Briefly explain following image enhancement method indicating their typical application area: [6]

- i) Contrast stretching
- ii) Median filtering
- iii) Unshrap masking

- b) Explain canny edge detector [4]

- Q5) a)** What is Morphological image processing? Explain Dilation, Erosion, opening and closing operation. [6]

- b) With neat block diagram explain JPEG baseline compression system [4]

- Q6) a)** Write an expression of 2 - D FDCT & IDCT. Explain each term used in these expressions. What are the DC & AC coefficients in DCT computations? [6]

- b) With reference to 2D transform explain [4]

- i) Basis images
- ii) Energy compaction
- iii) Symmetry
- iv) Separability

- Q7)** a) What is boundary representation? Explain how chain codes are used for boundary representation [6]
- b) Explain different surfaces used in radiometry and also explain which is better. [4]
- Q8)** a) Explain marr's top-bottom approach for conversion of 2D image to full 3D image [5]
- b) Explain pixel matching technique using stereo vision system. Define the matching parameters used for pixel matching. [5]



Total No. of Questions : 8]

SEAT No. :

P3229

[4660] - 1238

[Total No. of Pages : 3

M.E. (Electronics) (Digital Systems)
WIRELESS AND MOBILE TECHNOLOGIES
(2013 Course) (Semester - III) (604102)

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) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Explain in brief how Co-channel Interference and Adjacent Channel Interference influence the Cellular System Capacity. **[5]**

b) What are the functions of Authentication and Encryption in GSM? How is system security maintained? **[5]**

Q2) a) Name the main elements of the GSM system architecture and describe their functions. **[5]**

b) How is mobility restricted using WLANs? What additional elements are needed for roaming between networks, how and where can WLANs support roaming? **[5]**

Q3) a) If 20MHz of total spectrum is allocated for a duplex wireless cellular system and each simplex channel has 25KHz RF bandwidth, find: **[4]**

i) The number of duplex channels.

ii) The total number of channels per cell site, if $n = 4$ cell reuse is used.

b) Define: **[3]**

i) Flat Fading

ii) Frequency Selective Fading

iii) Fast Fading

P.T.O.

- c) Give reasons for a handover in GSM and problems associated with it. What are the four possible handover scenarios in GSM. [3]
- Q4)** a) What are the benefits of reservation schemes? How are collisions avoided during data transmission, why is the probability of collisions lower compared to classical Aloha? [4]
- b) What are the main problems of signal propagation? Why do radio waves not always follow a straight line? [3]
- c) Why is routing in multi-hop ad-hoc networks complicated, what are the special challenges? [3]
- Q5)** a) List the entities of mobile IP and describe data transfer from a mobile node to a fixed node and vice versa. [4]
- b) How can MACA still fail in case of hidden/exposed terminals? Think of mobile stations and changing transmission characteristics. [3]
- c) Define following parameters with reference to Wireless LANs: [3]
- i) Short inter-frame spacing (SIFS)
- ii) PCF inter-frame spacing (PIFS)
- iii) DCF inter-frame spacing (DIFS)
- Q6)** a) Explain Indirect TCP. State two advantages of I-TCP. [4]
- b) Explain Cell Splitting technique used in Cellular Systems in brief. [3]
- c) Explain near/far effect. How does it influence TDMA systems? What are counter measures in TDMA systems? [3]
- Q7)** a) If a mobile is located 5 km away from a base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2.55dB to receive cellular radio signals. The E-field at 1km from the transmitter is measured to be 10^{-3} V/m. The carrier frequency used for this system is 900 MHz. Find the received power at the mobile using the two-ray ground reflection model assuming the height of the transmitting antenna is 50 m and the receiving antenna is 1.5m above ground. [4]

- b) How does Dynamic Source Routing handle routing? [4]
- c) Why is the PHY layer in IEEE 802.11 subdivided? [2]
- Q8)** a) Consider HiperLAN2 standard that uses 16-QAM modulation technique with 3/4 coding rate for the pay load data transmission rate of 36 Mbps. [4]
- i) Calculate the coded bits per OFDM symbol.
- ii) Calculate data bits per OFDM symbol?
- b) What is the basic purpose of DHCP? Name the entities of DHCP. [4]
- c) How does registration on layer 3 of a mobile node work? [2]



Total No. of Questions : 8]

SEAT No. :

P3230

[Total No. of Pages : 2

[4660] - 1240
M.E (Production) (CAD/CAM)
COMPUTERAIDED DESIGN
(2013 Credit Pattern) (511301) (Semester - I)

Time : 2 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) Explain the importance of various stages of product life cycle. **[5]**

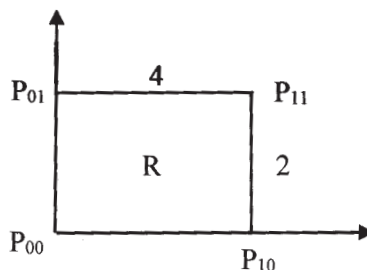
OR

Q2) Define Explicit, Implicit and parametric representation of geometrical entities and their advantages and disadvantages. **[5]**

Q3) What is blending of curves? Explain how two Bezier segments can be blended with suitable numeric example. **[5]**

OR

Q4) Find the equation of B-spline surface that covers the region R? Also, find the surface vectors and its mid-point? **[5]**



P.T.O.

Q5) Explain the procedure of mass property calculations in CAD software. [7]

OR

Q6) What is rendering? What are the different stages of rendering an image? [7]

Q7) a) Explain the basic fundamentals of solid modeling representation in any CAD software. [8]

b) Discuss in brief the basic elements of CSG model. Explain the main building operation of CSG scheme with examples. [7]

Q8) Write short note on any three: [18]

- a) Types of animations.
- b) Virtual Realism.
- c) CAD/CAM integration.
- d) Hidden line removal algorithm.



Total No. of Questions : 6]

SEAT No. :

P3026

[Total No. of Pages : 2

[4660] - 1242

M.E. (Production CAD/CAM) (Semester - I)
ADVANCED MATHEMATICS AND STATISTICS
(2013 Pattern)

Time : 2 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 $2x_1x_2 + 2x_1x_3 - 2x_2x_3$ to the canonical form by an orthogonal reduction and discuss its nature. Also find the modal matrix. [8]
- b) Find the curve on which the functional $\int_0^1 [(y')^2 + 12xy]dx$, with $y(0) = 0$ and $y(1) = 0$ can be extremised. [8]

OR

- Q2)** a) If $A = \begin{bmatrix} 0 & 1+2i \\ -1+2i & 0 \end{bmatrix}$ show that $(I - A)(I + A)^{-1}$ is a unitary 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]

- Q3)** a) Solve by the method of Laplace transform the equation [5]
 $y''' + 2y'' - y' - 2y = 0$ With $y(0) = y'(0) = 0$ and $y'(1) = 6$.

- b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for,
 $0 < x < \pi, 0 < y < \pi$, given that
 $u(0, y) = u(\pi, y) = u(x, \pi) = 0, u(x, 0) = \sin^2 x$ [8]

- c) Solve the integral equation : $\int_0^\infty f(x) \cos \lambda x dx = e^{-\lambda}$ [4]

P.T.O.

OR

- Q4)** a) A tightly stretched flexible string has its ends fixed at $x = 0$ and $x = l$. At a time $t = 0$, the string is given a shape defined by $f(x) = \mu x(l - x)$, where μ is a constant and then released, find the displacement of any point x of the string at any time $t > 0$. [8]
- b) Find the fourier transform of e^{-x^2} . [5]
- c) Apply convolution theorem to evaluate [4]

$$L^{-1} \left\{ \frac{s^2}{(s^2 + a^2)(s^2 + b^2)} \right\}$$

- Q5)** a) For a chi-square distribution with n.d.f. establish the following recurrence relation between the moments.
 $\mu_{r+1} = 2r(\mu_r + n\mu_{r-1}), r \geq 1$. Hence find β_1 & β_2 . [9]
- b) Discuss the state variable model and its advantages over differential equation model. [8]

OR

- Q6)** a) The height of six randomly chosen sailors are (in inch) : 63, 65, 68, 69, 71, 72. Those of 10 randomly chosen soldier's are 61, 62, 65, 66, 69, 69, 70, 71, 72, 73. Discuss the light that these data thrown the suggestions that sailors are on the average taller than soldier's. [9]
- b) Describe in brief types of simulation approaches. [8]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :2

P3068

[4660] - 1243

M.E (Production) (CAD/CAM)

**DESIGN OF EXPERIMENTS AND RESEARCH METHODOLOGY
(2013 Credit Pattern) (511304) (Semester - I)**

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 indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

- Q1)** a) Explain different types of research. [4]
b) Explain research process with flow chart. [4]
c) Enlist different types of data analysis method and explain any one in short. [2]
- Q2)** a) Write short notes on following: (any two) [8]
i) Criteria of good research.
ii) Brain Storming and Delphi method.
iii) Problem solving process.
b) Explain role of motivation in research. [2]
- Q3)** a) What are the techniques of interpretation? [4]
b) What is simulation and what are the application and classification of simulation models? [4]
c) What are the principles of modeling? [2]

P.T.O.

- Q4)** a) Explain objectives of research. [5]
b) How creativity is important in problem solving process? [5]
- Q5)** a) What are the objectives of experimentation? [4]
b) What are the steps in design of experimentation? [4]
c) What is factorial experimental design? [2]
- Q6)** a) Explain Taguchi approach to parameter design. [4]
b) Explain the method of two factor factorial design. [4]
c) What do you mean by response fitting curves? [2]
- Q7)** a) Explain format in report writing. [4]
b) Explain Univariate and Bivariate analysis with suitable example. [4]
c) Explain format of publication in research journals. [2]
- Q8)** a) Explain a Hypothesis Testing Parametric and Non Parametric approach with suitable Examples. [5]
b) How the genetic algorithm tool is used for optimizing the decision making criteria and for getting the better result? [5]



Total No. of Questions : 6]

SEAT No. :

P3069

[Total No. of Pages :2

[4660] - 1246

M.E (Production) (CAD/CAM Engineering)

FINITE ELEMENT ANALYSIS

(2013 Credit Pattern) (Semester - II) (511308)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Question No.5 and Question No. 6 are compulsory.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of non programmable calculator is allowed.*
- 6) *Assume Suitable data if necessary.*

Q1) a) Explain the basic steps in finite element problems formulation? [5]

b) Explain plain stress and strain with suitable examples. [5]

OR

Q2) a) Explain the penalty approach to solve one dimensional FEM problems?[5]

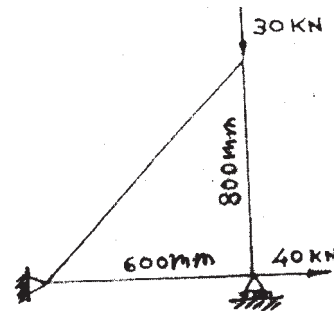
b) State the convergence requirements of shape functions. [5]

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]

Determine:

- i) The element stiffness matrix
- ii) Global stiffness matrix
- iii) Nodal displacement
- iv) Stresses in each element
- v) Reaction force

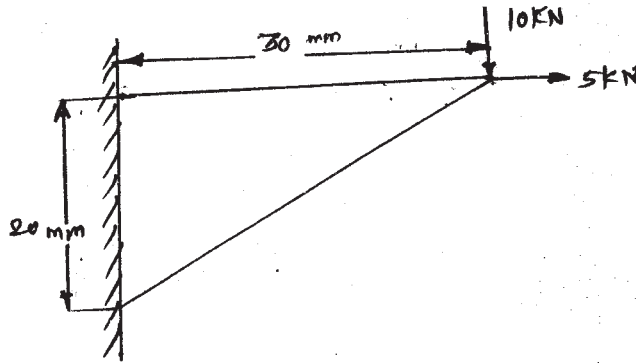


OR

P.T.O.

Q4) a) Determine shape function in for CST element in terms of natural co-ordinate systems. [4]

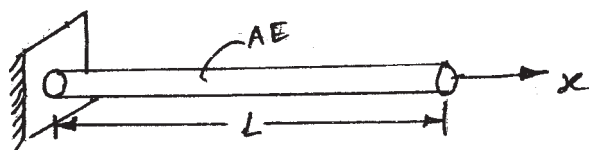
b) A 2D plate loaded is shown in figure. Determine the displacements of nodes using the plane stress condition. Ignore body forces. Determine the reaction forces also stress in the elements. Assume thickness as 10mm, $E = 70 \text{ GPa}$ & $\mu = 0.3$. [6]



Q5) a) Derive the element stiffness matrix and stress vector for frame element. [8]

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 . [7]

Q6) a) Using two equal length finite elements, determine the natural circular frequencies of the solid circular shaft fixed at end as shown in figure below: [7]



b) Explain Hamilton's principle along with derivation for equilibrium. [8]



Total No. of Questions: 8]

SEAT No. :

P3027

[Total No. of Pages : 2

[4660] - 1247

M.E.(Production - CAD/ CAM Engineering) (Semester - II)
OPTIMIZATION TECHNIQUES
(2013 Course)

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 cylindrical shell of heat exchanger is required to accommodate a total of 100 m length of standard diameter copper tubes. One meter square cross sectional area inside the shell can accommodate 200 copper tubes. cost of copper tubes is Rs 20000, cost of heat exchanger shell Rs. 60000 $D^{2.5}L$. Cost of floor space occupied by heat exchanger is Rs. 10000 DL Where, D is diameter of heat exchanger shell (m), L is length of heat exchanger (m).

- a) Formulate objective function to minimize cost and functional constraints.[4]
- b) Formulate Langrange expression. [2]
- c) Determine the optimum diameter and length of heat exchanger shell.[4]

Q2) a) Minimize the function $f(x) = 2x^2 + \frac{3}{x^3}$ using golden section method within the bounds of 0 to 3. Assume initial solution as 0. [4]

- b) Draw folwchart for Fibonacci search method. [4]
- c) Define: Interval of uncertainty. [2]

Q3) a) Perform two iterations of evolutionary optimization method to minimize: $(x_1 + 2x_2 - 7)^2 + (2x_1 + x_2 - 5)^2$ with $0 \leq x_1, x_2 \leq 6$. Assume initial solution as (3,3). [4]

P.T.O.

- b) Perform one iteration to minimize $4x_1^2 + 3x_2^2 - 5x_1x_2 - 8x_1$ using pattern search method. Assume initial solution as (0,0). [4]
- c) What is steepest ascent direction? [2]
- Q4)** a) Explain various gradient based methods for single variable optimization. [5]
- b) Write note on; Pareto optimal solutions. [5]
- Q5)** a) Discuss algorithm for interior penalty function method. [4]
- b) Write short note on: Artificial neural network. [4]
- c) What is parametric constraint. [2]
- Q6)** a) What is the function value corresponding to the coded value of substring x_1 as 11010 and substring x_2 as 1110 in genetic algorithm to minimize the function $x_1^2 - 3x_2 + 10$ with $0 \leq x_1 \leq 3$ and $2 \leq x_2 \leq 6$ [4]
- b) Explain any two methods of reproduction in used genetic in genetic algorithm. [4]
- c) What is termination criterion in simulated annealing method? [2]
- Q7)** a) Explain the drum buffer rope concept as applied to theory of constraints.[4]
- b) Explain with suitable example five focusing steps of theory of constraints. [4]
- c) Define capacity constraint resource. [2]
- Q8)** a) What do you mean by supervised and unsupervised learning in artificial neural network? Mention any two applications of each. [5]
- b) What is elitism concept in genetic algorithm? How it affect the performance of algorithm. [5]



Total No. of Questions : 6]

SEAT No. :

P3231

[Total No. of Pages : 2

[4660]-1249

M.E. (Production) (CAD/CAM)

ADVANCED STRESS ANALYSIS

(511313) (2013 Credit Pattern) (Semester-III)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Q. No. 5 and Q. No. 6 are compulsory.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data if necessary.*

Q1) a) Stress tensor at a point is given by

$$[\sigma_{ij}] = \begin{bmatrix} 5 & 0 & 0 \\ 0 & -6 & -12 \\ 0 & -12 & 1 \end{bmatrix}$$

Determine maximum shear stress at the point and show that it acts in a plane which bisects the maximum and minimum stress planes. **[6]**

b) Explain AIRY'S stress function for Rectangular co-ordinates. **[4]**

OR

Q2) a) Determine the principal deviator stress values for the stress tensor

$$[\sigma_{ij}] = \begin{bmatrix} 10 & -6 & 0 \\ -6 & 10 & 0 \\ 0 & 0 & 1 \end{bmatrix}. \quad \mathbf{[6]}$$

b) Explain experimental stress Analysis. **[4]**

Q3) Describe complex formulation of the plane elasticity problem. **[10]**

OR

P.T.O.

Q4) Describe mohr's circle for three dimensional stresses and Castigliano's theorem. **[10]**

Q5) a) Explain the terms isoclinics and isochromatics in photoelasticity. What is there physical significance in measurement of stresses? **[8]**

b) Describe stages in crack Growth. **[7]**

Q6) a) Explain paris equation and its application. **[8]**

b) Describe spring back effect in plastic bending. **[7]**



Total No. of Questions : 8]

SEAT No. :

P3028

[Total No. of Pages : 3

[4660] - 1252

M.E. (Production) (Manufacturing and Automation)

MATHEMATICS AND STATISTICS

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any 5 questions from 8 questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *All questions carry equal marks.*
- 5) *You are advised to attempt not more than 5 questions.*
- 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) Show that an analytic function with constant modulus is constant. [4]
b) Find the Laurent's series expansion of the function.

$$f(z) = \frac{1}{(z-1)(z-2)}; |z| < 1 \quad [3]$$

c) Evaluate $\int_c \frac{2z+1}{z(z+1)} dz$

Where c is the circle $|z| = \frac{1}{2}$. [3]

- Q2)** a) Using variational method, find the plane curve of fixed perimeter and maximum area. [5]

b) Find the extremals of the functional $\int_{x_0}^{x_1} \frac{y'^2}{x^3} dx$. [3]

- c) State the Lagrange's equation in generalised coordinates. [2]

P.T.O.

Q3) a) Explain the Schmidt explicit formula to solve the heat equation $u_t = c^2 u_{xx}$. [3]

b) Find the solution of parabolic equation $2 \frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$

When $u(0,t) = u(4,t) = 0; u(x,0) = x(4-x)$ taking $h = 1$. Compute the values to five levels. [5]

c) Classify the equation $y^2 u_{xx} - 2y u_{xy} + u_{yy} - u_y = 8y$. [2]

Q4) a) Prove that $(2n+1)P_n(x) = P'_{n+1}(x) - P'_{n-1}(x)$. [4]

b) Prove that $J_4(x) = \left(\frac{48}{x^3} - \frac{8}{x}\right)J_1(x) + \left(1 - \frac{24}{x^2}\right)J_0(x)$. [4]

c) State Rodrigue's formula and prove that $P_2(x) = \frac{1}{2}(3x^2 - 1)$. [2]

Q5) a) A random sample of size 25 from a normal population has the mean 47.5 with standard deviation 8.4. Does this information refuse the claim that the mean population is 42.1? (Given $t_{25,0.05} = 2.06$). [5]

b) The demand for a particular spare part in a factory was found to vary from day to day. In a sample study, following information was obtained.

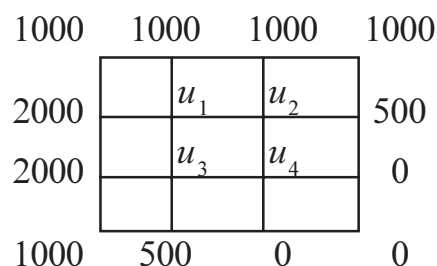
Day : Monday Tuesday Wednesday Thursday Friday Saturday

No. of

Spare parts : 1124 1125 1110 1120 1126 1115

Test the hypothesis that the number of spare parts demanded does depend on day of week. (Given $\chi^2_{5,0.05} = 11.07$). [5]

- Q6) a)** If $f(z) = u + iv$ is an analytic function and $u + v = e^{-x}(\cos y - \sin y)$ find $f(z)$ in terms of z . [5]
- b)** Given the values of $u(x, y)$ on the boundary of the square given in figure, evaluate the function $u(x, y)$ satisfying Laplace equation $\nabla^2 u = 0$ at the pivotal points of the figure. [5]



- Q7) a)** Fit the Poisson's distribution to the following data. [5]

x	:	0	1	2	3	4	5	6
f	:	275	72	30	7	5	2	1

- b)** Express x^5 in terms of $P_1(x)$, $P_3(x)$ and $P_5(x)$. [5]

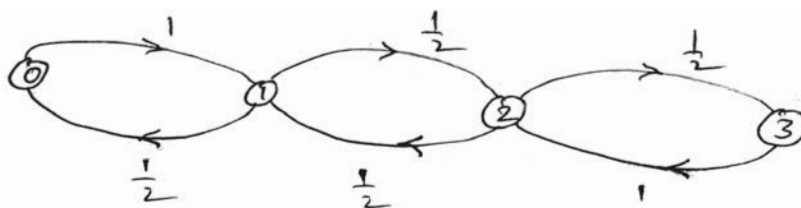
- Q8) a)** A set of five similar coins is tossed 320 times and the result is as follows: [5]

No. of Heads :	0	1	2	3	4	5
Frequency :	6	27	72	112	71	32

Test the hypothesis that the data follows Binomial distribution.

(Given $\chi^2_{5,0.05} = 11.07$).

- b)** Consider the discrete time Markov chain as follows : [5]



- i) Is the state 0 recurrent or transient?
- ii) Is the state 0 recurrent null or recurrent non-null?
- iii) Is the state 0 periodic or aperiodic?



Total No. of Questions : 8]

SEAT No. :

P3030

[Total No. of Pages : 2

[4660] - 1254

M.E. (Production) (Manufacturing & Automation)

ADVANCED MANUFACTURING PROCESSES

(2013 Pattern) (Semester - I)

Time : 2 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) Explain important steps of gating design followed in sand casting. [4]
b) Explain briefly injection molding process with neat sketch. [4]
c) List out the need of non-conventional machining processes. [2]
- Q2)** a) Explain with neat sketch working principle of Ultrasonic machining. [4]
b) Describe important characteristics of heat affected zone in welding. [4]
c) List out important mould filling defects with their remedies. [2]
- Q3)** a) Explain with neat sketch working principle of Electro Discharge machining. [4]
b) Explain any four sand casting defects with their causes and remedies. [4]
c) Differentiate between destructive and Non-destructive testing of welds. [2]
- Q4)** a) Describe principle of material removal, advantages and limitations of Electro Chemical Machining (ECM). [5]
b) Explain various welding defects with their causes and remedies. [5]

P.T.O.

- Q5)** a) A wire of 8.5 mm diameter is to be reduced to 5mm diameter. The die angle is 10° and the coefficient of friction at dies and wire interface is 0.5. The flow stress of wire material is 340 N/mm^2 . Determine drawing stress and drawing load if the drawing speed is 0.7 m/s. [4]
- b) Explain metal spinning with neat sketch. [4]
- c) Classify the non-conventional forming processes. [2]
- Q6)** a) Explain stretch forming with neat sketch. [4]
- b) Explain electromagnetic forming with neat sketch. [4]
- c) Differentiate between hot forming and cold forming. [2]
- Q7)** a) Explain important process parameters of electro-hydraulic forming. [4]
- b) A tube of 20 mm external diameter and 1 mm thickness is to be reduced to 18 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/mm^2 . The tube drawing is carried at a speed of 0.4 m/s. Calculate drawing stress and drawing load using fixed plug. [4]
- c) What is fine blanking? [2]
- Q8)** a) Explain various rolling problems. [5]
- b) Explain forming limit diagram. [5]



Total No. of Questions : 8]

SEAT No. :

P3031

[Total No. of Pages : 3

[4660] - 1255

M.E. (Production - Manufacturing & Automation) (Semester - I)

RESEARCH METHODOLOGIES

(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 side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Differentiate between descriptive and experimental research. [4]
b) What are the qualities of good research? [4]
c) State any four problems faced by researchers in India. [2]

- Q2)** a) Describe any two types of informal experimental design. [4]
b) Distinguish between systematic and stratified sampling. [4]
c) Explain the meaning of extraneous variable. [2]

- Q3)** a) What are the merits of interview method? [4]
b) What is secondary data? What precautions must be taken while collecting secondary data? [4]
c) Why tabulation is essential in analysis of data? [2]

Q4) Write short notes on the following:

- a) Randomization and blocking in experimental design. [5]
- b) Time series analysis. [5]

P.T.O.

- Q5) a)** Three hundred ball bearings have a mean weight of 15.3 gm and standard deviation of 0.9 gm. Find the probability that a random sample of 60 ball bearing chosen from this group will have a combined weight more than 930 gm. The areas under standard normal curve are as shown in Table 1: **[4]**

Table 1

z	1.5	1.6	1.7	1.8	1.9	2	2.1
Area under curve	0.4332	0.4452	0.4554	0.4641	0.4713	0.4772	0.4821

Assume linear interpolation for values in between.

- 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]**

Table2

	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
X_4	78	50	10	40
X_5	60	20	10	50

- c)** Two hundred bolts were selected at random from the production of each of four machines. The numbers of defective bolts found were 2, 9, 10, 3. Determine whether there is significant difference between the machines using a significant level of 0.05. The Chi-Square distribution with degrees of freedom is shown in Table 3: **[2]**

Table 3

Degree of freedom	$\chi^2_{0.990}$	$\chi^2_{0.975}$	$\chi^2_{0.950}$	$\chi^2_{0.900}$
1	6.63	5.02	3.84	2.71
2	9.21	7.38	5.99	4.61
3	11.3	9.35	7.81	6.25
4	13.3	11.1	9.49	7.78

- Q6) a)** A firm has to select a robot from four robots based on the three criteria namely: Purchase cost (PC); Load carrying capacity (LC); and Repeatability error (R). Weightages for Purchase cost, Load carrying capacity, and Repeatability error are 0.40, 0.35 and 0.25 respectively. The attribute data for four robots is given in Table 4.

Table 4

	PC(Rs.)	LC(kg)	R (mm)
Robot 1	7,30,000	48	0.15
Robot 2	7,10,000	46	0.18
Robot 3	7,50,000	51	0.14
Robot 4	6,90,000	45	0.13

Formulate a linear programming model for data envelopment analysis.

[4]

- b) What is the function value corresponding to the coded value of substring x_1 as 1011 and that of x_2 as 0101 in genetic algorithm to minimize the function $3x_1^2 - 5x_1x_2 + x_2^2 - 10$ with $2 \leq x_1, x_2 \leq 6$. **[4]**
- c) For a minimization problem, using simulated annealing, the function value of 120 is updated to new value of 142 at temperature 200°C. What is the probability of accepting the new solution? **[2]**

- Q7) a)** Why proper interpretation of research findings is important? What are various techniques of interpretation? **[4]**

- b) What is significance of report writing? Explain steps in writing report. **[4]**

- c) Give the general layout of a research report. **[2]**

Q8) Write short notes on:

- a) Analytic hierarchy process. **[5]**

- b) Graph theory and matrix approach. **[5]**



[4660] - 1257

M.E. (Production) (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) A line segment having end points (1, 1, 0) and (6, 2, 0) is lying in xy plane. Rotating this line about x axis yields a conical surface. Determine the point on this surface for parameter value ' t ' = 0.4 and rotation angle of 60° . [4]
- b) Write a CNC part program to mill slot shown in **Fig. 1**. [4]

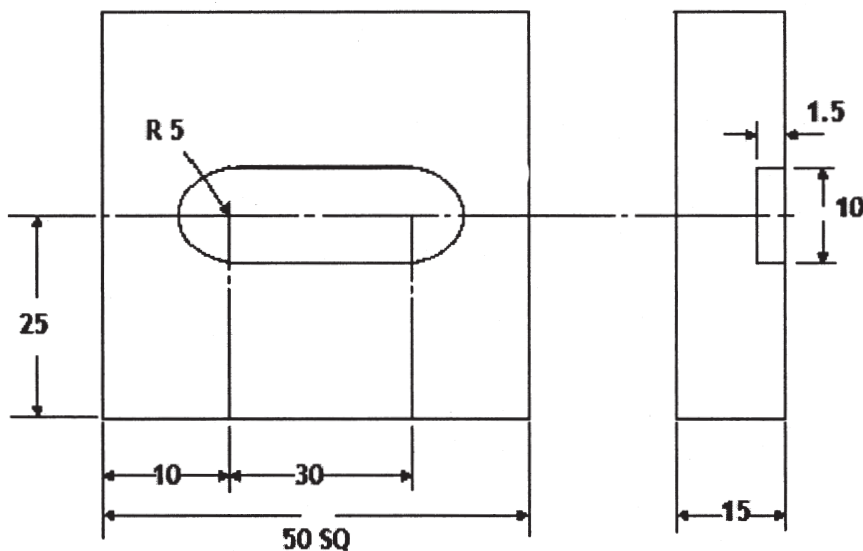


Fig. 1

- c) Mention primary variable, coefficient, source term and secondary variable required to model heat transfer problem. [2]

P.T.O.

Q2) a) Generate four points on the parabolic segment in the first quadrant for $1 \leq x \leq 4$ if the focus of the parabola is at (1, 0). [4]

b) Solve the problem described by the following equation using finite element analysis considering uniform mesh of two elements: [4]

$$-\frac{d^2u}{dx^2} = \cos \pi \cdot x \text{ for } 0 < x < 1, u(0) = 0, u(1) = 0.$$

c) What is format for circular interpolation using arc vector method? [2]

Q3) a) A steel rod of diameter 25 mm, length 75 mm, and thermal conductivity 50 W/m°C is exposed to ambient air at temperature 20°C with heat transfer coefficient of 100 W/m²°C. The left end of the rod is maintained at temperature 320°C and the other end is insulated. Determine the temperature distribution in the rod. Use a mesh of two linear elements. [4]

b) How the tool length offset is determined? How does a programmer allow for a tool length offset in a part program? [4]

c) Mention the names of various solid modeling techniques. [2]

Q4) a) Write short note on “Tool path generation and verification”. [5]

b) Write short note on : “Steps in finite element analysis”. [5]

Q5) a) What are the essential requirements of a relational database management system? [4]

b) Describe the operating environment required to apply CIM-OSA model. [4]

c) What are the functions of a database administrator? [2]

Q6) a) Describe in brief the structure of a Material Requirement Planning (MRP) system. [4]

b) What are the common topologies used in computer networks? [4]

c) State any four important benefits of FMS. [2]

Q7) a) What are the functions of shop floor control in any modern organization? **[4]**

b) Consider the following part-machine incidence matrix. Apply Similarity coefficient method to identify the part families and machine groups **[4]**

	J1	J2	J3	J4	J5	J6
M1	1			1	1	
M2		1				
M3			1		1	
M4	1		1			
M5		1		1		1

c) Draw the general configuration of an adaptive control system. **[2]**

Q8) a) Write a short note on “Machine Vision”. **[5]**

b) Explain the role of cost planning and control within the Computer Integrated Production Management system. **[5]**



Total No. of Questions : 8]

SEAT No. :

P3033

[Total No. of Pages : 3

[4660] - 1258

M.E. (Production) (Manufacturing and Automation)

TOOLAND DIE DESIGN

(2013 Pattern) (Semester - II)

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 logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) In an orthogonal cutting chip thickness = 0.5 mm, feed = 0.2 mm/rev and rake angle = 10° . Calculate dynamic shear stress involved in deformation. [4]

b) Explain the effect of work material microstructure on the machinability. [4]

c) When the use of positive rake angle and negative rake angle is preferred? [2]

Q2) a) Derive an expression to determine the width of diamond pin locator. [4]

b) Draw neat sketch of any one type of equalizer. [2]

c) A cylindrical workpiece $\phi 50f6$ is located on V-block with 60° included angle. Calculate the locating error on the top surface and bottom surface of the workpiece. [4]

Q3) For the component shown in **Fig. 1**.

a) Draw strip layout for progressive die. [2]

b) Determine the press tonnage required. [4]

c) Sketch the progressive die showing all details. [4]

P.T.O.

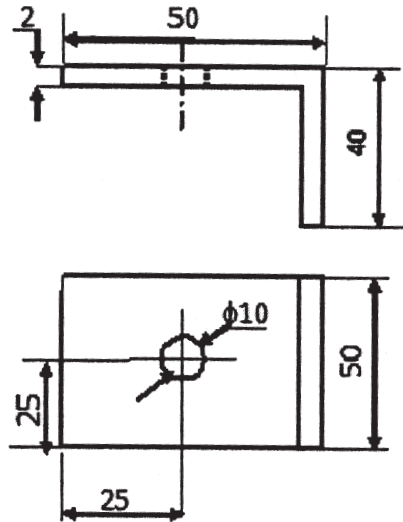


Fig. 1

Q4) Write short notes on:

- a) Quick acting clamps. [5]
- b) Factors affecting clearance in press tools. [5]

Q5) a) Explain steps to calculate stock size in forging operation. [4]

- b) Explain various factors affecting the selection of parting line in forging operation. [4]

- c) Write formula to calculate flash thickness and flash width. [2]

Q6) For the component shown in Fig. 2 an injection mold is to be designed,

- a) Determine ejector force. [4]
- b) Calculate the mold opening force. [4]
- c) Determine the diameter of the runner. [2]

Given that: Shrinkage = 0.95%, Coefficient of friction = 0.15, Material constant for PVC = 0.9, Poisson ratio and Modulus of elasticity for mold material are 3.33 and 2×10^5 respectively, Injection pressure 40 MPa. Modulus of elasticity for PVC is 3×10^3 MPa.

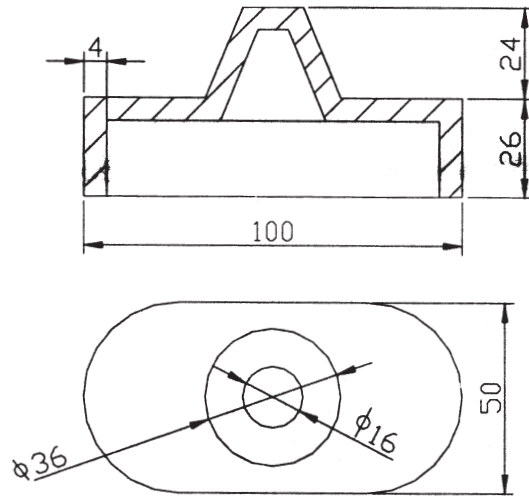


Fig. 2

- Q7)** a) Explain design of gating system in die casting. [4]
 b) Discuss clamping force analysis in die casting. [4]
 c) Sketch the ejection mechanism in die casting. [2]

Q8) Write short notes on:

- a) Defects in die casting. [5]
 b) Design of blocking impression in forging dies. [5]



Total No. of Questions : 8]

SEAT No. :

P3034

[Total No. of Pages : 2

[4660] - 1259

M.E. (Production) (Manufacturing and Automation)

ADVANCED JOINING PROCESSES

(2013 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. :

P3035

[Total No. of Pages :2

[4660]-1261

M.E. (Production) (Manufacturing and Automation)

ADVANCED ROBOTICS

(Semester-III) (2013 Credit Pattern) (611101)

Time : 2 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) *All questions carry equal marks.*
- 4) *Your are advised to attempt not more than 05 questions.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Explain four basic robot configurations. [4]
b) Discuss robot applications in the field of material handling and processing operations. [4]
c) Explain the terms accuracy and repeatability. [2]
- Q2)** a) Explain geometric parameters θ_i, α_i, a_i and d_i related to link of robot arm. [4]
b) Explain Euler angle representations and obtain a composite rotation matrix for Euler angle system ϕ, θ, ψ . [4]
c) What is inverse Kinematics problem? [2]
- Q3)** a) Write a note on adaptive control. [4]
b) A 7 kg. rectangular block is gripped in the middle and lifted vertically at a velocity 2 m/s. If it accelerates at 27m/s^2 and coefficient of friction between gripping pads and the block is 0.5 calculate the minimum force that would prevent slippage. [4]
c) Explain briefly adhesive grippers. [2]
- Q4)** a) Explain Denavit- Hartenberg algorithm for link coordinate system assignment. [5]
b) Write a note on mechanical type grippers. [5]

P.T.O.

- Q5)** a) Mention methods of robot programming and explain lead through programming in detail. [4]
 b) Explain first generation languages of robot programming. [4]
 c) Explain WAIT and SIGNAL command. [2]
- Q6)** a) Write a note on proximity and range sensors. [4]
 b) Explain segmentation in machine vision. [4]
 c) What is machine vision? [2]
- Q7)** a) What are singularities of a manipulator? How are they classified and determined? [4]
 b) Determine Jacobian and Joint velocities for a 3 DOF planar arm with revolute joints. [4]
 c) What is Jacobian? [2]

Q8) a) Given a coordinate frame $A = \begin{bmatrix} 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 2 \\ 1 & 0 & 0 & 10 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

Find the differential transformation of A corresponding to a differential rotation $\Delta\theta = 0.1\hat{i} + 0\hat{j} + 0\hat{k}$ followed by a differential translation of $\Delta d = 0\hat{i} + 0.5\hat{j} + 1\hat{k}$ with respect to base frame. [5]

- b) The given data represents 8×8 array of pixels. Each element in the array indicates the grey level value of the pixels. Construct histogram for the array and obtain appropriate threshold value. [5]

10	11	10	11	12	12	12	12
13	15	17	17	17	17	15	13
14	17	19	19	19	19	18	14
13	17	19	20	20	19	18	13
12	17	19	20	21	19	18	12
12	17	19	19	19	19	18	12
11	15	18	18	18	18	15	11
12	11	10	11	12	12	12	12

Total No. of Questions : 8]

SEAT No. :

P3036

[Total No. of Pages :2

[4660]-1262

M.E. (Production Engineering)

SURFACE ENGINEERING

(2013 Credit Pattern) (Semester-III) (611102)

Time : 2 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]**

Q3) a) Write short notes on:

i) Carburising **[4]**

ii) Nitriding **[4]**

b) List out some reasons of surface hardening of industrial parts. **[2]**

P.T.O.

- 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 Proceesing. [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]



Total No. of Questions : 12]

SEAT No. :

P3070

[Total No. of Pages : 3

[4660] - 1264
M.E. (Computer Engineering)
APPLIED ALGORITHMS
(2013 Credit Pattern) (Semester - I) (510101)

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) *Assume Suitable data, if necessary.*

Q1) a) Solve following recurrence:

$$t(n) - 2t(n-1) = 3^n \quad [4]$$

b) Explain with examples Big “oh”, Theta and Omega notations. [5]

OR

Q2) a) State whether following equalities are correct or incorrect [4]

i) $6n^2 - 7n = \theta(n^2)$

ii) $10n^2 + 5n + 6 = \Omega(n^4)$

iii) $1000n + 6 = O(n^3)$

iv) $7 \cdot 2^n + n^2 = \Omega(2^n)$

b) Explain in detail Analysis of algorithms. [5]

Q3) a) Write recursive binary search algorithm and determine its time complexity by recurrence. [4]

b) Give quick sort algorithm with time analysis using recurrence. [4]

OR

Q4) a) Give and explain the Greedy Kruskal’s minimum spanning tree algorithm. [4]

b) Write Dijkstra’s algorithm for a directed graph. Compare it with all pairs shortest path algorithm. [4]

P.T.O.

- Q5)** a) Prove that directed Hamiltonian cycle is NP complete. [4]
 b) Explain vertex cover problem as an example of approximation algorithm. [4]

OR

- Q6)** a) Give an approximation algorithm for travelling salesman problem. [4]
 b) Explain an approximation algorithm for knapsack problem. [4]

- Q7)** a) Explain in detail Polynomial reducibility. [4]
 b) Explain in detail closest pair problem with applications. [4]

OR

- Q8)** a) Give divide and conquer algorithm for solving closest pair of points problem. [4]
 b) How to prove that given problem is NP complete. [4]

- Q9)** a) Construct the dual of the given problem [4]

$$\text{Min } Z = 3x_1 - 2x_2 + 4x_3$$

STC

$$3x_1 + 5x_2 + 4x_3 \geq 7$$

$$6x_1 + x_2 + 3x_3 \geq 4$$

$$7x_1 - 2x_2 - x_3 \leq 10$$

$$x_1 - 2x_2 + 5x_3 \geq 3$$

$$4x_1 + 7x_2 - 2x_3 \geq 2$$

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

- b) Give and Explain simplex algorithm. [4]

OR

Q10)a) Transform following linear program into standard form. **[4]**

Maximize to $x_1 + x_2$

$$2x_1 + x_2 \leq 4$$

$$x_1 + 2x_2 \leq 3$$

$$x_1, x_2 \geq 0$$

b) Explain problem formulation for knapsack problem. **[4]**

Q11)a) Explain different distributions with examples. **[4]**

b) The following table gives data on the type of car, grouped by petrol consumption owned by 100 people. **[5]**

	Low	Medium	High	Total
Male	12	33	7	52
Female	23	21	4	48
Total				100

OR

Q12)a) Explain random variable with suitable example. **[4]**

b) Explain Bay's rule with example. **[5]**



Total No. of Questions : 6]

SEAT No. :

P3072

[Total No. of Pages : 3

[4660] - 1266

M.E (Computer)

ADVANCED COMPUTER ARCHITECTURE

(2013 Course) (510103) (Semester - I)

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) *Assume Suitable data if necessary.*

Q1) a) Describe the four variants of PRAM model and compare it with parallel computer architectures. **[5]**

b) State the concept of fine grain and coarse grain scheduling. How the grain size affects on the parallelism observed in multiprocessor systems? **[4]**

OR

a) State the following terms w.r.t parallelism and dependence relations: **[5]**

- i) Communication latency
- ii) flow dependence
- iii) Antidependance
- iv) Output dependence
- v) Resource dependence

b) State and define the routing functions of Mesh and Hypercube Interconnection Network. **[4]**

Q2) a) How Flynn has classified parallel computers? Why MISD architecture does not exist? **[4]**

b) State briefly the standard measures adopted by Industry to compare the performance of parallel computer systems. **[4]**

OR

P.T.O.

- a) What is Scalability? State the various metrics used to define the scalability. [4]
- b) Derive the Gustafson's law for speedup performance. How is it different than Amdahl's law? [4]

Q3) a) State and obtain the performance of a k-stage pipeline processor handling n instructions w.r.t following parameters- [4]

i) Speedup ii) Efficiency iii) Throughput

- b) Discuss the address translation mechanism for a system supporting paging mechanism. [4]

OR

- a) State the 4-level memory hierarchy defined for a computer system. How the data transfer takes place between adjacent levels of a memory hierarchy? [4]
- b) Explain in brief, the use of Reservation stations and Hardware scoreboarding for dynamic instruction scheduling in pipeline processors. [4]

Q4) a) What are the multi-threaded architectures? Discuss the various performance parameters of multi-threaded processor architectures. [4]

- b) What are the cache write policies used for cache updating? With state diagram explain the Write Invalidate cache coherency protocol. [4]

OR

- a) With block diagram explain the architecture of multivector multiprocessor. [4]
- b) What is data parallel programming? Compare between SPMD and MPMD programming. [4]

Q5) a) Explain with example the use of synchronization primitives in parallel programming. [4]

- b) Compare PVM with MPI Message passing libraries. [4]

OR

- a) What do you mean by implicit and explicit parallel programming? Compare between synchronous and asynchronous message passing. [4]
- b) State the standard constructs and compiler directives used in High Performance Fortran (HPF) or Fortran - 90 as a data parallel programming language. [4]

Q6) a) Explain the Three Tier architecture of cloud computing. [5]

- b) Discuss important features of Quantum computing. How these architectures can be used for distributed parallel processing. [4]

OR

a) State the following terms w.r.t. Grid computing. [5]

i) Middleware

ii) OGSA

iii) OGSI

- b) Explain different services offered by Cloud. What is the difference between public and private cloud? [4]



Total No. of Questions : 6]

SEAT No. :

P3073

[Total No. of Pages :2

[4660]-1267

M.E. (Computer Engineering)

RESEARCH METHODOLOGY

(Semester-I) (2013 Credit Pattern) (510104)

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 logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam table is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Explain what is research. Compare: **[9]**

- i) Applied research vs. Fundamental research, and
- ii) Conceptual research vs. Empirical research.

OR

b) Enlist and explain essential components of research process and explain significance of the research. **[9]**

Q2) a) What is the importance of defining a research problem? Explain different steps in defining research problem. **[8]**

OR

b) Explain different types of hypothesis. Explain the process of hypothesis formulation with suitable examples? **[8]**

Q3) a) Explain with suitable examples: **[8]**

- i) The Principle of Replication
- ii) The Principle of Randomization, and
- iii) The Principle of Local Control.

OR

b) Why probability sampling is generally preferred in comparison to non-probability sampling? Explain the procedure of selecting a simple random sample. **[8]**

P.T.O.

- Q4) a)** The incidence of a certain disease is such that on average, 20% of workers suffer from it. If 10 workers are selected at random, find the probability that **[8]**
- i) Exactly 2 workers suffer from the disease
 - ii) Not more than 2 workers suffer from the disease
 - iii) At least 9 workers suffer from the disease

OR

- b) An insurance company receives on an average 2 telephone calls every 12 minutes. Find the probability that **[8]**
- i) No call,
 - ii) Three calls are received in 30 minutes
(Given $e^{-5}=0.007$)

- Q5) a)** In the frequency distribution of 200 students given below:

Marks	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	10	28	-	60	-	20	16

Find the missing frequencies, if the median value of the data is 45. Hence find the arithmetic mean of the entire data. If 10% of the students below the A.M. are considered above the pass marks find the pass marks. **[8]**

OR

- b) In the context of hypothesis testing, What are type I and Type II errors? Comment upon the need for a researcher to strike a balance between type I and Type II errors. **[8]**

- Q6) a)** Explain the significance of a research report and narrate the various steps involved in writing such a report. **[9]**

OR

- b) What is the queuing theory? What types of questions are sought after analyzing queuing systems? Explain, What is Little's law and its use in Queuing theory. **[9]**

□□□□

Total No. of Questions : 8]

SEAT No. :

P3074

[Total No. of Pages :2

[4660]-1269

M.E. (Computer Engineering)

OPERATING SYSTEM DESIGN

(2013 Pattern) (Semester-II) (510107)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any six 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) Which is the role played by general purpose and control registers? What is the difference between these registers? **[4]**
- b) Why do you we call operating system an event handler and table manager. **[2]**
- c) Give the computation that shows that the disk controller can access a disk up to 4 G bytes. **[3]**
- Q2)** a) What is quantum in round-robin scheduling? How does round-robin do if the system is heavily loaded? **[4]**
- b) Suppose we wanted to change the message size used in the simple operating system from 8 words to 1024 words. What changes in the code would be required? Give some good and bad effects. **[5]**
- Q3)** a) With the help of mathematical model explain the relationship between signaling, rendezvous and producer- consumer patterns. **[4]**
- b) How process is created using fork system call in Unix? **[2]**
- c) Demonstrate use of “Reducing a problem to a special case” design technique in the context of operating system. **[2]**

P.T.O.

- Q4)** a) With the help of mathematical model demonstrate the working of IPC pattern. [4]
i) Mutual Exclusion
ii) Signaling
- b) Discuss buses and taxis in terms of multiplexing. Discuss computer buses in terms of multiplexing. [4]
- Q5)** a) Page Segments would seem like an ideal solution that combines the advantages of pages with the advantages of segments. With mathematical model explain why this is not so? [4]
- b) What are the different strategies for decomposing a system? [4]
- Q6)** a) Explain the memory management design problem. What are the solutions available to memory management design problem? [4]
- b) Explain scheduling in Real time operating systems. [4]
- Q7)** a) What is DMA controller? Why DMA is useful? Give two advantages of DMA device controller over non DMA device controller. [4]
- b) Give an example of an adjoined name space. In the context of adjoined directories, what does shadowing mean? Give an example of shadowing. [4]
- Q8)** a) Explain the design technique of late binding for virtual memory. [2]
- b) Explain the use of cryptography in Computer security with example. [4]
- c) Give some reason why it would be nice if users could mount file systems. Give some problems that it would cause. [3]



Total No. of Questions : 6]

SEAT No. :

P3075

[4660] - 1270

[Total No. of Pages : 2

M.E. (Computer Engineering)
SOFTWARE DESIGN AND ARCHITECTURE
(2013 Credit Pattern) (Semester -II) (510108)

Time :3 Hours]

[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) Describe design solution. What are the two major components of a software design method? **[8]**

OR

Q2) a) What are design patterns? How they are documented using a template? Explain the way they are documented with examples to illustrate from Facade pattern. **[8]**

b) What is design notation? Explain with example. **[8]**

Q3) a) What is software architecture? Why it is important? What are the different Quality Attribute scenarios? **[8]**

b) Explain the styles of module view-type and execution Architecture View type. **[8]**

OR

P.T.O.

- Q4)** a) Explain styles of Component-and-connector view-type. [8]
b) List Quality Attribute and Explain testability with its scenario. [8]

- Q5)** a) What are the concepts of Data-Centered Software Architecture. Evaluate the benefits and limitations of data-centered software architecture and examine data-centered architecture when incorporated with other architectures. [9]
b) Write short notes on:- [9]
i) Model Driven Architecture (MDA)
ii) Customer Relationship Management (CRM)

OR

- Q6)** a) Describe a complete object-oriented analysis and design process and discuss general design principles in the context of object-oriented design. [9]
b) Explain the concepts of any three archetype patterns. [9]



Total No. of Questions : 6]

SEAT No. :

P3076

[4660] - 1271

[Total No. of Pages : 2

M.E. (Computer Engineering)
ADVANCED COMPUTER NETWORKS
(2013 Credit Pattern) (Semester -II) (510109)

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) Explain what is reliable data delivery in brief? What is a network design tool? Explain major components of Network design tool. **[9]**

OR

b) Enlist and explain the general principles of Network Design and explain the issue of “mobility” with suitable example. **[9]**

Q2) a) Consider a disk drive that can complete an average request in 10 ms. The time to complete a request is exponentially distributed. Over a period of 30 minutes, 117,000 requests were made to the disk. How long did it take to complete the average requests? What is the average number of queued requests? **[8]**

OR

b) Messages arrive to a system at the rate of 10 per minute. Their lengths are exponentially distributed with an average of 3600 characters. They are transmitted on a 9600 bps channel. A character is 8 bit long. **[8]**

- i) What is the utilization of the server?
- ii) What is the probability that there are 2 messages in the system?
- iii) What is the average number of messages in the system?
- iv) What is the average time in the system?

P.T.O.

Q3) a) Explain Sharma's Algorithm with the help of suitable example. [8]

OR

b) Define minimum spanning tree. Explain Bin Packing Algorithm. [8]

Q4) a) What is quality of service in networks? Explain different Queue management algorithms. [9]

OR

b) Explain resource reservation with respect to Quality of Service in Networks. [9]

Q5) a) Explain what is routing using masks with suitable examples? [8]

OR

b) Explain how fragmentation is handled in IPv4 and IPv6. [8]

Q6) Write Short notes on (Any Two) [16]

- a) Wireless and sensor networks.
- b) Multimedia networking.
- c) Content Distribution Network protocols.
- d) Domain specific networks.



Total No. of Questions : 6]

SEAT No. :

P3077

[4660] - 1273

[Total No. of Pages : 2

M.E. (Computer Engineering)
ADVANCED STORAGE SYSTEMS AND INFRASTRUCTURE
MANAGEMENT
(2013 Credit Course) (Semester -III) (610101)

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.*

- Q1) a)** Explain why **[5]**
- i) RAID 1 is not a substitute for a backup?
 - ii) RAID 0 is not an option for data protection and high availability?
- b) Consider an application that generates 8,400 IOPS, with 70 percent of them are reads. Calculate the disk load in RAID 1 and RAID 5. Also determine the number of disks required to meet the workload for the RAID 1 and RAID 5 configuration. **[5]**
- Q2) a)** What are the mechanisms for configuration of storage virtualization? What are the important challenges in storage virtualization? Explain in detail different types of storage virtualization. **[5]**
- 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. **[5]**
- Q3) a)** Explain in detail storage array based Remote replication? **[5]**
- b) What is the importance of recoverability and consistency in local replication? **[5]**

P.T.O.

- Q4)** a) What are the current business demands and IT systems issues? [6]
b) Discuss on complexity of today's computing environment. [4]
- Q5)** a) Explain with neat diagram Information Technology Infrastructure Library. [5]
b) What are the Factors to be considered in designing IT organizations and IT infrastructure? [5]
- Q6)** a) Write short note on IT services continuity Management and availability management. [5]
b) What are the important factors that should be managed in Service support process? [5]



Total No. of Questions : 12]

SEAT No. :

P3078

[4660] - 1274

[Total No. of Pages : 2

M.E. (Computer Engineering)
ADVANCED UNIX PROGRAMMING
(2013 Credit Pattern) (Semester - III) (610102)

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 calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Explain the concept of journaling in ext 4 file system? Describe three types of journaling available in ext4 file system. **[4]**

b) Explain IA-64 architecture with a suitable diagram. **[5]**

OR

Q2) a) What is a shell? Explain various shell responsibilities in brief. **[4]**

b) What happens on fork () system call execution? Which properties are inherited by the child from the parent? **[5]**

Q3) a) How is “Non-Local” Goto handled by using setjmp () and longjmp (). Explain with an example. **[5]**

b) Explain the working of unreliable and reliable signals in Unix. **[3]**

OR

Q4) a) Explain in detail Virtual Memory Management in Unix. **[4]**

b) Define process and explain process management in Unix. **[4]**

P.T.O.

- Q5) a)** What is the basic difference between select () & pselect () functions used in I/O multiplexing? [4]
- b) Write a note on Record Locking. [4]

OR

- Q6) a)** Which are the characteristics of buffering? Also describe the types of buffering. [6]
- b) Compare Advisory locking with Mandatory locking. [2]

- Q7)** Compare and contrast the various IPC mechanisms: Pipe, FIFO, Message Queue and semaphores. [8]

OR

- Q8) a)** Explain the process of writing and reading data from PIPES. [4]
- b) Explain Shared Memory structure maintained by Kernel in detail. [4]

- Q9) a)** How does synchronization take place in multithreading? [4]
- b) What is Multiprocessor interface? Explain in detail. [4]

OR

- Q10)a)** Discuss the significance of stub in RPC. [3]
- b) Write a code to explain Prethreading creation and termination. [5]

- Q11)a)** Write a program to design simple client and server communication using sockets. [5]
- b) What is socket? Compare and contrast UNIX Domain sockets with Raw sockets. [4]

OR

- Q12)a)** Explain in detail IPv4 socket structure with a suitable diagram. [4]
- b) What is a socket? Explain the different types of sockets? [5]



Total No. of Questions : 12]

SEAT No. :

P3079

[4660] - 1276

[Total No. of Pages : 2

M.E. (Computer Engineering) (Computer Networks)
ADVANCED NETWORK ALGORITHMS
(2013 Credit Pattern) (Semester - I) (510201)

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) *Assume suitable data if necessary.*

Q1) a) Explain the term network bottleneck. Explain different router bottlenecks. **[4]**

b) Justify the statements: **[4]**

- i) Network algorithmics is interdisciplinary
- ii) Recognizes the primacy of systems thinking
- iii) Network algorithmics can benefit from algorithmic thinking.

OR

Q2) a) With reference to 15 implementation principles, explain principles related to “systems thinking”. **[4]**

b) With reference to network implementation models, explain performance environment and measures. **[4]**

Q3) a) With respect to buffer validation of application device channels, Explain the scenario to select the next eligible VC in fair manner. **[4]**

b) For a large network, considering the slow response to failures and other network topology changes, how can route computation be speeded up? **[4]**

OR

P.T.O.

- Q4)** a) With reference to Ethernet monitor using bridge hardware, how can an hacker use the existing engine to look up address pairs? [4]
b) For incrementally reading a large database, find a way for the database to efficiently perform incremental queries. Find solution that is less burdensome for the database program. [4]

- Q5)** a) Explain why do systems need timers with suitable examples? [5]
b) Explain various routines in a timer module. [4]

OR

- Q6)** a) Write note on timing wheels. [5]
b) Write note on hierarchical wheels. [4]

- Q7)** a) List the principles involved in prefixed match lookups. [4]
b) Explain non-algorithmic techniques for prefix matching. [4]

OR

- Q8)** a) Write a note on memory allocation in compressed schemes. [4]
b) Write a note on lookup chip model. [4]

Q9) Explain in brief Linear Search Algorithms. [8]

OR

- Q10)** a) Explain the significance of packet classification. [4]
b) Explain decision tree approach to packet classification. [4]

- Q11)** a) With reference to router as distributed systems write a note on internal flow control. [4]
b) Measurement of network traffic is hard: Justify. [5]

OR

- Q12)** a) Explain Principles used in the implementation of the various security primitives. [5]
b) Explain in details the technique of detecting worms. [4]



Total No. of Questions : 6]

SEAT No. :

P3081

[4660] - 1278

[Total No. of Pages : 3

**M.E. (Computer Network)
ADVANCED DATABASES
(2013 Credit Pattern) (Semester - I) (510203)**

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) *Assume suitable data if necessary.*

Q1) Consider the following BCNF relation, which lists the ids, types (e.g., nuts or bolts), and costs of various parts, along with the number available or in stock: **[8]**

Parts (pid, pname, cost, num _ avail)

You are told that the following two queries are extremely important:

- Find the total number available by part type, for all types. (That is, the sum of the num _ avail value of all nuts, the sum of the num _ avail value of all bolts, and so forth).
 - List the pids of parts with the highest cost.
- a) Describe the physical design that you would choose for this relation. That is, what kind of a file structure would you choose for the set of Parts records, and what indexes would you create?
 - b) Suppose your customers subsequently complain that performance is still not satisfactory (given the indexes and file organization you chose for the Parts relation in response to the previous question). Since you cannot afford to buy new hardware or software, you have to consider a schema redesign. Explain how you would try to obtain better performance by describing the schema for the relation(s) that you would use and your choice of file organizations and indexes on these relations.
 - c) How would your answers to the two questions change, if at all, if your system did not support indexes with multiple-attribute search keys?

P.T.O.

Q2) What is recovery process in distributed database? What are the different ways of failure modes? [6]

Q3) a) Consider a multithreaded process that delivers messages from a durable queue of persistent messages. Different threads may run concurrently, attempting to deliver different messages. In case of a delivery failure, the message must be restored in the queue. Model the actions that each thread carries out as a multilevel transaction, so that locks on the queue need not be held until a message is delivered. [4]

b) Explain how a TP monitor manages memory and processor resources more effectively than a typical operating system. [2]

Q4) Give the DTD or XML Schema for an XML representation of the following nested-relational schema. [10]

Emp = (ename, ChildrenSet setof (Children), SkillsSet setof (Skills))

Children = (name, Birthday)

Birthday = (day, month, year)

Skills =(type, ExamsSet setof (Exams))

Exams =(year, city)

Write the queries in XQuery:

a) Find the names of all employees who have a child who has a birthday in November.

b) Find those employees who took an examination for the skill type “typing” in the city “Pune”.

c) List all skill types in Emp.

Q5) a) Suppose you have a relation containing the x,y coordinates and names of restaurants. Suppose also that the only queries that will be asked are of the following form: The query specifies a point, and asks if there is a restaurant exactly at that point. Which type of index would be preferable, R-tree or B-tree? Justify your answer. [3]

- b) Suppose you have a spatial database that supports region queries (with circular regions) but not nearest-neighbor queries. Describe an algorithm to find the nearest neighbor by making use of multiple region queries. [3]
- c) Name several application that deal with spatial data & specify their requirements on a database system. [4]

- Q6)** a) Many applications need to generate sequence numbers for each transaction: [6]
- If a sequence counter is locked in two-phase manner, it can become a concurrency bottleneck. Explain why this may be the case.
 - Many database systems support built-in sequence counters that are not locked in two-phase manner; when a transaction requests a sequence number, the counter is locked, incremented and un-locked.
- i) Explain how such counters can improve concurrency.
- ii) Explain why there may be gaps in the sequence numbers belonging to the final set of committed transactions.
- b) What are the three broad levels at which a database system can be tuned to improve performance? Give two examples of how tuning can be done for each of the levels. [4]



Total No. of Questions : 12]

SEAT No. :

P3082

[4660] - 1279

[Total No. of Pages : 2

M.E. (Computer Network)
RESEARCH METHODOLOGY
(2013 Credit Pattern) (Semester - I) (510204)

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) Describe the different types of research, clearly pointing out the difference between an experiment and a survey. **[9]**

OR

Q2) “Research has gained importance in all the functional areas of Management.” Discuss. **[9]**

Q3) What is research problem? Define the main issues which should receive the attention of the researcher in formulating the research problem. Give suitable examples. **[8]**

OR

Q4) What is hypothesis? Explain the procedure for hypothesis testing. Explain different characteristics the hypothesis must process in order to be a good research. **[8]**

Q5) What do you mean by research design? Differentiate between research methodology and research design. Illustrate your answer with suitable example. **[8]**

OR

P.T.O.

Q6) Explain the suitable examples of some of the important research design used in experimental hypothesis testing research. [8]

Q7) Enumerate the different methods of collecting data. What is observation method of data collection? Explain the terms: Structured observation, unstructured observation, controlled observation and uncontrolled observation? [9]

OR

Q8) In a certain examination three papers were administered and following were the results: 20%, 30% and 25% of the candidate failed in papers 1, 2 and 3 respectively. 10% failed in both papers 1 and 2, 8% failed in papers 2 and 3 and 6% failed in papers 1 and 3. 2% failed in all papers. If a candidate is selected at random find: [9]

- a) The probability that he has failed in either of the three papers.
- b) Probability that the candidate has passed in all 3 papers.

Q9) What does a measure of central tendency indicate? Describe the important measures of central tendency pointing out the situation when one measure is considered relatively appropriate in comparison to other measures. [8]

OR

Q10) Describe the precautions that the researcher should take while interpreting his findings. [8]

Q11) What do you mean by multivariate analysis? Explain how it differs from bivariate analysis? [8]

OR

Q12) Explain the significance of a research report and narrate the various steps involved in writing such a report. [8]



Total No. of Questions : 12]

SEAT No. :

P3083

[4660] - 1281

[Total No. of Pages : 3

M.E. (Computer Networks)
NETWORK DESIGN, MODELING AND ANALYSIS
(2013 Credit Pattern) (Semester - II) (510207)

Time :3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams/flows must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data if necessary.*

Q1) a) Explain probability distribution function with the help of mathematical modeling. **[4]**

b) What is probability mass function for a random variable? What is its significance in the network designs? **[4]**

OR

Q2) a) Explain continuous random variable, discrete random variable and expectations of random variable. **[4]**

b) Give Mathematical model of cumulative distribution function. **[4]**

Q3) a) Explain with modeling a Little's Theorem. What is probabilistic form of Little's theorem. **[5]**

b) Give various queueing models with probabilistic variables. **[4]**

OR

Q4) a) In a queueing model of M/M/1 type a network is with a capacity of accomodating 10 messages. Assuming average arrival rate as 0.4 and service rate as 0.5 find **[6]**

i) Utilization of network

ii) With same arrival rate and service rate an extra service capacity.

iii) Average no. of messages in waiting.

iv) Average no. of messages in network.

P.T.O.

- b) Explain mathematical model of exponential distribution in queueing model. [3]

Q5) a) What is basic philosophy of multipoint line layout Heuristics in the network designs. [4]

- b) Explain Esau-Williams Algorithm with its modeling. [4]

OR

Q6) a) What are Greedy algorithms and Exchange algorithms? Explain in brief. [3]

- b) Differentiate following concentrator algorithms based on their applicability to the network designs. [5]

i) Center of Mass (COM)algorithm

ii) Add algorithm

iii) Drop algorithm

Q7) a) What is access network design? Give various issues in simple access network design. [5]

- b) What are line crossings in access design? Give details of line crossings. [4]

OR

Q8) a) Give the model of multicenter local access design. What are main issues in multicenter local access design? [5]

- b) Describe one speed one center design in details. [4]

Q9) a) How network design can become good design? Explain with various parameters. [4]

- b) Give MENTOR algorithm for MUX and router design. [4]

OR

Q10)a) What are various parameters of network back bone designs? How these parameters can influence the network design? [4]

b) Describe Augmented MENTOR design. [4]

Q11)a) What are reliability constraints of network design? Explain. [4]

b) Explain following. [4]

i) Hop-limited design

ii) Node-pair

OR

Q12)a) What is meaning of redesigning for new traffic? Explain in brief. [4]

b) Discuss the phenomenon of merging networks. [4]



Total No. of Questions : 8]

SEAT No. :

P3084

[4660] - 1282

[Total No. of Pages : 2

M.E. (Computer Engineering) (Computer Networks)
DISTRIBUTED SYSTEMS
(2013 Credit Pattern) (Semester - II) (510208)

Time :3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any three questions from Q.1, 2, 3, 4 and any three questions from Q.5, 6, 7, 8.*
- 2) *Assume suitable data if necessary.*

- Q1) a)** What are main advantages of RPC system that allows the binding between a client and a server to change dynamically? What are the main issues involved in providing this flexibility? **[5]**
- b) Explain in brief location transparency in distributed systems. **[4]**

- Q2)** Explain Lamport algorithm and compare its performance and reliability with Ricart and Agrawala's algorithm. Discuss advantages & disadvantages of both algorithm. **[8]**

- Q3) a)** What is a deadlock? Discuss any one distributed deadlock detection algorithm in detail. **[5]**
- b) Discuss Agreement protocols. **[3]**

- Q4)** Explain what is meant by absolute ordering, consistent ordering & casual ordering of messages. Give a mechanism to implement each one. **[8]**

- Q5) a)** What is a fault tolerant system. What are different failure types? **[4]**
- b) Discuss backward & forward error recovery. **[4]**

OR

P.T.O.

Q6) a) What are three main approaches for designing a DSM system. [4]

b) Explain distributed file system requirements in detail. [4]

Q7) What is SOAP? Why SOAP? Explain SOAP building blocks. [8]

Q8) Write short notes on: [9]

a) WSDL

b) VDDI

c) XML Security



Total No. of Questions : 8]

SEAT No. :

P3085

[4660] - 1283

[Total No. of Pages : 2

**M.E. (Computer Networks)
HIGH PERFORMANCE NETWORKS
(2013 Credit Pattern) (Semester - II) (510209)**

Time :3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any three questions from Question No. 1, 2, 3, 4 and any three questions from Question Number 5, 6, 7, 8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagram wherever necessary.*
- 4) *Assume suitable data if necessary.*

Q1) a) What are different VoIP components? Explain VoIP Network requirement. **[5]**

b) What is 10-gigabit Ethernet? Explain Gigabit Ethernet Technology in detail. **[4]**

Q2) a) Explain in brief Gigabit Ethernet WAN applications. **[4]**

B) Why 4G speeds are much faster compared to 3G? Explain. **[4]**

Q3) a) Explain architecture of Gigabit Ethernet. **[4]**

b) Why Doing Carrier Extension for the First Frame in a Burst? **[4]**

Q4) a) How are ATM cells mapped on the following physical layer interfaces**[4]**

i) DS 1,

ii) DS 3,

iii) E3,

iv) STS-3c

b) Explain ATM protocol reference model. **[4]**

P.T.O.

- Q5)** a) What applications could exploit MPLS. [4]
b) “MPLS also support native encapsulation” comment. [4]
- Q6)** a) Explain IEEE 802.16 Protocol Architecture in detail. [4]
b) Explain the features of Wireless LANs (IEEE 802.11). [4]
- Q7)** a) Comment on “Will Fixed WiMAX Die?” [4]
b) Discuss the Salient Features of Broadband wireless networks. [4]
- Q8)** a) Which are the differnt scheduling algoritms are used for HSDPA to schedule the transmission for users. [5]
b) Explain UMPS and LTE in detail. [4]



Total No. of Questions : 8]

SEAT No. :

P3086

[4660] - 1285

[Total No. of Pages : 2

M.E. (Computer Engineering) (Computer Networks)

ADVANCED TCP/IP

(2013 Credit Pattern) (Semester - III) (610201)

Time :3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Solve any three questions from Q.1, 2, 3, 4 and any three questions from Q.5, 6, 7, 8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data if necessary.*

Q1) Write TCP connection establishment and termination process steps with state transition diagram. **[9]**

Q2) a) Show the sequence of characters exchanged between the TELNET client and the server to switch from line mode to default mode. **[4]**

B) Show the query message requesting the domain name for challenger.atc.fhda.edu. What is the size of a query message? **[4]**

Q3) a) If a browser does not send an HTTP content-length header before a request, how does server respond? **[4]**

b) User aaa@xxx.com sends a message to user bbb@yyy.com. The latter replies. Show all SMTP commands and responses. **[4]**

Q4) a) The following is a dump of a SCTP DATA chunk in hexadecimal format.
00000015 00000005 0003000A 00000000 48656C6C 6F000000**[4]**

i) Is this an ordered or unordered chunk?

ii) Is this the first, the middle, or the only fragment?

iii) What is the TSN?

iv) What is the SI?

b) Why do HTTP, FTP, SMTP, and POP3 run on top of TCP rather than on UDP? **[4]**

P.T.O.

Q5) Draw and explain FSM describing TCP congestion protocol. [8]

Q6) a) Differentiate between AODV and DSDV protocols in wireless environment. [4]

b) Explain the given term: [4]

i) TCP Testwood

ii) TTCP

Q7) a) Draw a figure to show the position of ESP in IPv6. [4]

b) Explain the phases of key management in IPsec. [4]

Q8) Host A and B are directly connected with a 200Mbps link. There is one TCP connection between the two hosts. Host A is sending to Host B an enormous file over this connection. Host A can send application data into the link at 100Mbps but Host B can out of its TCP receive buffer at a maximum rate of 50Mbps. Describe the effect of TCP flow control. [9]



Total No. of Questions : 8]

SEAT No. :

P2736

[4660] - 3

[Total No. of Pages : 3

**M.E. (Civil- Construction and Management)
CONSTRUCTION TECHNOLOGY
(2008 Course) (Semester -I) (501103)**

Time :4 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Enlist the tunnelling methods in hard strata. Explain the cut and cover method of tunnelling. Where it is recommended? Comment on its use for metro tunnels. [8]
- b) What are the different methods of underwater concreting? Explain tremie method of underwater concreting with suitable diagram. [8]
- Q2)** a) Explain with sketches the method of construction of “Diaphragm Wall” using Bentonite Slurry for underground section of Metro Railway Project. [8]
- b) What are the different grouting techniques? Explain the Jet grouting technique and its application. [8]
- Q3)** a) What are the different methods of dewatering for shallow and deep excavations. Explain installation and operation of deep well point system of dewatering. [10]
- b) Explained with label sketches in details pneumatic caissons. [8]

P.T.O.

Q4) Write a short note on any four of the following. **[16]**

- a) Precautions in use of concrete pumps.
- b) Chemical grouting technique.
- c) Vacuum dewatering by electro-osmosis.
- d) Merits and demerits of RMC (Ready Mix Concrete)
- e) Enlist the methods of shuttering.

SECTION - II

Q5) a) Give the classification of piles based on **[10]**

- i) Mechanism of load transfer
- ii) Method of installation
- iii) Type of material used

State the advantages and disadvantages of concrete piles.

b) What are the different loads considered on piles. **[6]**

Q6) a) Explain with a neat sketch under-reamed pile. Give the advantages and disadvantages of precast and cast-in-situ piles. **[10]**

b) What are the different methods of pile driving? Explain any one. **[6]**

Q7) a) What are the different types of cofferdam and caissons. Explain the factors to be considered for construction of cofferdam. **[10]**

b) A tunnel is to be excavated in soft strata with following details: **[8]**

- i) Depth of overburden: 20m
- ii) Diameter of tunnel: 7.8m and Length: 2km
- iii) Purpose of tunnel: Railway tunnel

iv) Strata: Lateritic soil

v) Water-table: at a depth of about 10m below G.L.

Suggest the best suitable method of tunnelling you feel. Suggest all the provisions to be made as an expert in tunnelling.

Q8) Write a notes on any four of the following.

[16]

- a) Accelerated curing methods in high rise buildings.
- b) Single acting hammers in driven piles.
- c) Advantages of micro piles.
- d) Friction piles.
- e) Precautions to be taken for pump concrete for high rise buildings.



Total No. of Questions : 8]

SEAT No. :

P3447

[Total No. of Pages : 2

[4660] - 4

M.E. (Civil) (Construction Management)

NEW CONSTRUCTION MATERIALS

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

Time : 4 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 is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

Q1) Explain the smart materials and methods used for constructing nuclear-containment reactor as compared with conventional materials and methods used. Explain with a case study. State the norms suggested by Government of India in this regard? **[18]**

Q2) a) What is difference between silica fume concrete and self compacting concrete? **[8]**

b) Explain different types and application areas for each type. **[8]**

Q3) a) Explain why the use of Glenium concrete based on nanotechnology, give Total Quality Control concept in concrete. **[8]**

b) Explain chemical properties of any four construction admixtures. **[8]**

P.T.O.

- Q4)** Explain recent developments related to following materials and procedure of use; **[16]**
- a) HPC
 - b) Fly ash
 - c) FRPC
 - d) CMBR

SECTION - II

- Q5)** Discuss advantages, disadvantages and limitations of fly ash as a construction material. Explain with functional flow chart, manufacturing process of using fly ash as construction material. State feasibility report. **[18]**
- Q6)**
- a) Explain in brief construction chemicals used in SSC with their effects on SSC. **[4]**
 - b) Discuss in brief how mix design of SSC differs from conventional concrete. **[6]**
 - c) Write down advantages and applications of SSC. **[6]**
- Q7)**
- a) Explain the properties and use of high performance concrete. **[8]**
 - b) Explain the advantage and limitations of silica fume concrete. **[8]**
- Q8)** Explain details of :- **[16]**
- a) Use of smart material.
 - b) Use of different fiber concrete.
 - c) Use of Eco friendly materials.
 - d) Use of fly ash.



Total No. of Questions : 6]

SEAT No. :

P2737

[4660] - 5

[Total No. of Pages : 2

M.E. (Civil) (Construction and Management)
b- DISASTER MANAGEMENT
(2008 Pattern) (Semester - I) (Elective - I) (501104)

Time :4 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Enlist various types of terrestrial disasters. Which of these disasters are man made and natural disasters? Discuss about preventive measures related to these disasters. [6]
- b) Discuss about the physical, economic and environmental losses that occur on account of forest fires and volcanoes. [6]
- c) In event of a major natural disaster it is common phenomenon of outbreak of epidemic diseases. Enlist the causes of this type of secondary disaster and suggest suitable preventive measures. [6]
- Q2)** a) What do you mean by Contingency Planning in case of Natural Disasters? Explain this concept with respect to cyclone disaster clearly detailing the steps involved. [8]
- b) Enlist and explain various terms and concepts with respect to earthquakes. [4]
- c) Explain the different methods for awareness creation in community with respect to disaster preparedness. [4]

P.T.O.

- Q3) a)** Explain the role of Remote Sensing and GIS in Early Warning systems and Disaster preparedness. [8]
- b) Urbanization and modern technology ensures comfortable life. However it is a major reason of disaster. Explain this statement with suitable examples. [8]

SECTION - II

- Q4) a)** As a planning engineer being a part of Disaster response team, plan a relief camp for a village with population of 10,000 people affected by flood disaster. The planning and design thumb rules should be clearly stated and in conformance with SPHERE GUIDELINES. Undertake the design process for: [10]
- i) Water supply and sanitation.
- ii) Solid waste management.
- b) What are the different sources of drinking water? Enlist and explain the various technical criteria considered for short listing an appropriate source in case of emergency response. [4]
- c) Discuss importance of sanitation in emergencies. Explain in detail link of Sanitation with water supply and hygiene promotion. [4]
- Q5) a)** Explain Disaster Response Mechanism in India. Discuss the organization structure for Response mechanism from Central Government level to District level administration clearly explaining the roles and responsibilities of all concerned involved. [10]
- b) Enlist various water treatment processes available in case of water supply in emergency response. Explain in detail with appropriate sketches any two methods. [6]
- Q6) Write short notes on:** [16]
- a) Emergency Response process.
- b) Civil Engineering interventions in Emergencies.
- c) Ground water sources and their yield.
- d) Water quality standards in Emergencies.



Total No. of Questions : 8]

SEAT No. :

P2917

[Total No. of Pages : 3

[4660] - 524

M.E. (Information Technology) (Semester - II)

NET CENTRIC COMPUTING

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

Q1) a) Give meaning of each parameter of 10 Mbps Ethernet Technology such as Propagation velocity, encoding, propagation delay, Interframe Gap, Backoff limit and Jam size. [8]

b) State the functions of session layer. Is it present in HTTP protocol? [8]

Q2) a) How Network administrator handles the following network problem : Link delay, high rate collision, polling delay and component latency. [8]

b) How collision is resolved in CSMA/CD protocol? [8]

P.T.O.

Q3) a) The arrival rate of messages at the network is 10/minute. The distribution of length is exponential with an average of 2000 characters. The transmission channel capacity is 11.2 kbps. A character is 24 bit long. Calculate : **[10]**

- i) Arrival rate
- ii) Average service time
- iii) Utilization of server
- iv) Average waiting time
- v) Average time in the system

b) What are the functionalities of OSI model w.r.t. **[6]**

- i) Data representation on network media.
- ii) Method for data transmission time.

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

- a) PSTN gateways.
- b) Architecture of ADSL.
- c) SPX/IPX network stack.
- d) Bin packing algorithm.

SECTION - II

Q5) a) What is collision domain and broadcast domain? Compare hub, switch and router w.r.t. them. **[10]**

b) State and explain the reason of using ATM technology as a backbone for Internet. **[6]**

Q6) a) Explain in detail upstream and downstream criteria in DSL line. **[8]**

b) How queuing theory calculates utilization of server? **[8]**

- Q7)** a) Define with example following network security terminologies : **[8]**
- i) Authorization
 - ii) Certification
 - iii) Confirmation
 - iv) Time Stamping
- b) State the importance of all security levels provided by RAID technology? **[8]**

- Q8)** Write short notes on (any three) : **[18]**
- a) Lossless Compression.
 - b) Backup management in RAID.
 - c) Kerberos.
 - d) SAN.



Total No. of Questions : 8]

SEAT No. :

P2918

[Total No. of Pages : 2

[4660] - 525

**M.E. (Information Technology) (Semester - II)
ADVANCED TRENDS IN DATABASE SYSTEM
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Answer any three questions from Section - I and any three questions from Section - II.*
- 2) *Answer to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Make suitable assumptions whenever necessary.*

SECTION - I

- Q1)** a) What is Replication and Fragmentation of data? Define them with respect to where data is stored. [8]
b) What is a distributed Database? Explain advantages and disadvantages of distributed database. [8]
- Q2)** a) Give difference between OLAP and OLTP. [8]
b) Explain subject - oriented, integrated, time - variant nonvolatile, w.r.t. Data warehousing in detail. [8]
- Q3)** a) Explain Decision - Tree Algorithm for Data Mining with proper example. [8]
b) Explain KDD process in detail? Explain why Data Mining. [8]
- Q4)** Write short notes on (any 3) : [18]
a) XML facets
b) Correlation in data mining
c) Business intelligence
d) Dashboards

P.T.O.

SECTION - II

- Q5)** a) Explain what is ECA. [4]
b) Enlist the applications of Active databases. [6]
c) Discuss the design and implementation of Active d/bs. [6]
- Q6)** a) Explain in detail TP Monitor. [8]
b) Discuss about Object Databases and OR mapping. [8]
- Q7)** a) Explain web crawling along with its characteristics and crawling policies. [8]
b) Explain following terms in IR with suitable example : [8]
i) Synonyms
ii) Homonyms
iii) Proximity
iv) TF-IDF
- Q8)** Write short notes on (any 3) : [18]
a) Document Ranking
b) Google Boat : A web spider
c) Unsupervised learning
d) Hadoop



Total No. of Questions : 10]

SEAT No. :

P2919

[Total No. of Pages : 3

[4660] - 526

M.E. (Information Technology)

**MANAGEMENT TRENDS IN INFORMATION TECHNOLOGY
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the Candidates :

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

SECTION - I

- Q1)** a) The NilStar sells television sets, computers, laptop, CD drives, DVD players, microwaves, refrigerators and cosmetics. Explain how NilStar company can use IT. Who are the users and how they are benefited? [8]
- b) Enlist benefits of Enterprise Resource Planning in any organization? [8]
- Q2)** a) A private sector commercial bank operates in three states of India. Its principal function includes operating customers saving, current and fixed accounts. It advances loan to individuals and organization. They operations of the bank presently have manual information system. It now wants to convert these systems into well-integrated computer-based systems. For this purpose bank wants to identify its subsystems. You are required to advice the bank in this matter. How will you advice the bank. Make suitable assumptions. [8]
- b) Explain with a neat sketch; the steps involving in the software efforts and cost estimation process. [8]

P.T.O.

- Q3)** a) Explain five distinct aspects which the Project Manager should consider when preparing a project communications plan. [8]
b) List the steps to construct a work breakdown structure for a software project. [8]
- Q4)** a) Explain approaches/tactics which a Project Manager might consider when optimizing the resource allocation for a project. [8]
b) Discuss on the efforts measures in software estimation process. State their significance and purpose. [8]
- Q5)** a) Developing self directed project teams are key to improving the effectiveness in Project Management and successful completion of the project. Discuss with examples from your experience. [9]
b) Define a milestone in the software development. How it is represented in the WBS? [9]

SECTION -II

- Q6)** a) Compare and contrast the issues of CPM and PERT model. Illustrate the use of network diagram for CPM analysis. [8]
b) Explain the major parts in building the Software Quality Assurance (SQA) plan and its role in product development life cycle. [8]
- Q7)** a) List down the various product development techniques that a project manager needs to be familiar with. Give suitable examples to justify your answer. [8]
b) Explain two types of team-building activities of Project Human Resource Management. [8]
- Q8)** a) List common threats & measures required for overcoming threats? [8]
b) Explain approaches to making Ethical Judgments. Also explain how you would encourage ethical conduct in the society. [8]

- Q9)** a) Create and explain a Decision Support System (DSS) for earthquake management. Assume suitable data. [8]
- b) Explain with suitable example the impact of IT on Quality Management Systems. [8]

Q10) Write short note on any THREE of the following : [18]

- a) Energy Audit.
- b) Trade Secrets.
- c) Scope of Copyright Act.
- d) Project Delays.
- e) Intellectual property Rights (IPR).



Total No. of Questions : 8]

SEAT No. :

P2920

[Total No. of Pages : 2

[4660] - 527

M.E. (Information Technology) (Semester - II)
INTERNET AND WEB TECHNOLOGIES (Elective - III)
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:-

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

SECTION - I

- Q1)** a) Explain how name resolution happens in DNS. Enlist all resource records. [6]
- b) How DHCP assigns addresses dynamically? Explain stepwise procedure carried out by DHCP server and DHCP client. [6]
- c) How does SSL handshake work? [4]
- Q2)** a) Explain SNMP model with its major components. [6]
- b) What does CGI stand for and what is its function? [6]
- c) Explain proxy server. Why are proxy servers useful? [4]
- Q3)** a) Explain Struts. How the validation is performed in strut applications? [6]
- b) Explain the importance of SOAP protocol. State its advantages. [6]
- c) Explain the relationship between WSDL and UDDI. [4]

P.T.O.

Q4) Answer any three short notes (with illustration) : **[18]**

- a) XML.
- b) JAVA Scripts.
- c) AJAX
- d) WEB 2.0
- e) Java Beans.

SECTION - II

Q5) a) What is the difference between Internet and WWW? Can Internet work without WWW? **[8]**

b) Explain N-tier web system. State its advantages and disadvantages. **[8]**

Q6) a) Explain persistent and non persistent HTTP connection with suitable diagrams. **[8]**

b) What is CORBA? Explain the role of skeleton and stub with a neat diagram. **[8]**

Q7) a) Explain the servlet life cycle. **[8]**

b) Compare and Contrast applets with servlets. **[8]**

Q8) Write any three short notes (with illustration) : **[18]**

- a) JSR 168 Portlet API.
- b) JNDI.
- c) Java Applets.
- d) Java Mail API.
- e) MVC design patterns.



Total No. of Questions : 8]

SEAT No. :

P2921

[Total No. of Pages : 2

[4660] - 528

M.E. (Information Technology) (Semester - II)

ADVANCED TOPICS IN OPERATING SYSTEMS

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

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) Compare Linux OS Architecture with Windows OS architecture. [9]

b) Explain the Solaris OS architecture in detail. [9]

Q2) Explain the following with respect to Linux OS. [16]

a) LWP creation using `sys_clone ()`

b) `pthread_create ()`

c) `fork ()`

d) `execve ()`

e) `wait ()`

Q3) Explain the following with respect to Windows OS. [16]

a) Address translation.

b) Page fault handling.

c) Virtual address space layout.

P.T.O.

- Q4)** a) Explain vmalloc(), kmalloc() and slab with respect to Linux OS. [8]
b) Explain the segment descriptor in Linux OS. [8]

SECTION - II

- Q5)** a) Explain Windows NTFS design goals and features. [8]
b) Compare NTFS and FAT32 file systems of Windows. [8]

- Q6)** a) Explain the need of VFS in Linux. Also explain how Windows File system can be mounted on Linux file system? [8]
b) Explain the concept of inode in detail Linux OS. [8]

- Q7)** a) Explain the PnP manager on Windows OS in detail. [8]
b) Explain the necessity of I/O scheduler in Linux OS. [8]

- Q8)** Write short notes on the following (Any Three) : [18]
a) Setting up TCP/IP in Windows.
b) Setting up TCP/IP in Linux.
c) Superblock in Linux.
d) Windows file system formats.
e) Device driver in Windows.
f) Device driver in Linux.



Total No. of Questions : 10]

SEAT No. :

P2922

[Total No. of Pages : 2

[4660] - 529

M.E. (Information Technology) (Semester - II)

C : MOBILE COMPUTING AND M-COMMERCE

(2008 Pattern) (Elective - III)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:-

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Question no. 5 and Question no. 10 are compulsory.*
- 3) *Answer three questions from each section.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Figures to the right side indicate full marks.*
- 6) *Use of Calculator is allowed.*
- 7) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Define the : IMEI, IMSI, TMSI and SIM. [8]
- b) Explain GSM addresses and Identifiers in detail. [8]
- Q2)** a) Describe the GPRS architecture and protocols. How many of them already exist in GSM. [8]
- b) What are various strengths of SMS? Explain all of them. Also state what are the applications areas where these strengths can be used? [8]
- Q3)** a) What is Wi-Max? How it is different than Wi-Fi? [8]
- b) What are advantages of spread spectrum techniques? Explain in detail spread spectrum techniques. [8]

P.T.O.

- Q4)** a) What is MMS? How is it different from Short Message Service and extended Message service? Explain the MMS architecture with diagram? [8]
b) Explain in detail different security techniques in mobile computing. [8]
- Q5)** Write a short note on (any two) : [18]
a) Bluetooth Technology.
b) Wireless Broadband.
c) EDGE.

SECTION - II

- Q6)** a) Describe the various cryptographic algorithms. What is the difference between a digital signature and digital certificate? Why do you need at third party in certification? [8]
b) Explain the concept of wireless markup language. [8]
- Q7)** a) Explain framework for M-commerce and levels of framework. [8]
b) Explain in detail at least 4 emerging application of M-commerce. [8]
- Q8)** a) What are the emerging issues in mobile commerce? [8]
b) Explain the implementation challenges in M-commerce. [8]
- Q9)** a) What is WAP Push? How is PUSH different from pull? [8]
b) Explain with functional diagram GPRS architecture. [8]
- Q10)** Write a short note on (any two) : [18]
a) Mobile OS.
b) VLR Database Overflow.
c) 3G technology.



Total No. of Questions : 6]

SEAT No. :

P2923

[Total No. of Pages : 2

[4660] - 530

M.E. (Information Technology) (Semester - II)

USER INTERFACE DESIGN

(2008 Pattern) (Elective - III)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate answer sheet.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) How does the knowledge of users' abilities affect interface design? [8]
b) Compare and contrast motivating factors between life-critical systems and those for home, office, or entertainment. [8]
- Q2)** a) Write a comment on : "A design should be User - Centric". [8]
b) Outline **Three** benefits of good user interface design. Justify your reasoning for each of these. [8]
- Q3)** a) List and explain Norman's four principles of good design. [8]
b) A different human/computer interface would be needed for each of the following users : [10]
i) a young child in a primary school
ii) a blind person
iii) a graphic artist
For each user describe and justify an appropriate human/machine interface.

P.T.O.

SECTION - II

- Q4)** a) Explain the guidelines for data display and data entry? [8]
b) Give three benefits and three problems of touch screens. [8]
- Q5)** a) Discuss the characteristics of good web page design. [8]
b) Compare and contrast online help with offline help. [8]
- Q6)** a) Describe the user interface development process, starting at the earliest stages and continuing up to the point when the interface is complete. Name the steps in this process and briefly describe what happens. Briefly discuss the importance of each step, what specific things we must pay the most attention to, and how information relevant to the step is gathered, analyzed, or used. If steps are repeated describe : why, what changes, and when you stop. [10]
- b) Give one good feature and one bad feature of each of these interaction styles. [8]
- i) command language
 - ii) form based
 - iii) question and answer
 - iv) menu based
 - v) natural language (English)
 - vi) direct manipulation
 - vii) virtual reality



Total No. of Questions : 8]

SEAT No. :

P2924

[Total No. of Pages : 2

[4660] - 532

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

ADVANCED NETWORK PROGRAMMING

(2008 Pattern) (Elective - IV)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:-

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

SECTION - I

- Q1)** a) Discuss in detail Protocol Usage by Common Internet Applications. [8]
b) Explain why must value-result arguments such as the length of a socket address structure be passed by reference? [8]
- Q2)** a) Explain steps and buffers involved when an application writes to a TCP Socket with a neat diagram. [8]
b) Explain Simple echo client server along with the functions used for input & output. [8]
- Q3)** a) Write detailed steps that allow an IPV4 TCP client to communicate with an IPV6 server with suitable diagram. [8]
b) List types of operations are supported on a routing socket and explain types of messages exchanged across a routing socket. [8]

P.T.O.

- Q4)** Write Short Notes on: **[18]**
- a) Outline for typical concurrent server.
 - b) Generic socket options.
 - c) Buffer Sizes & Limitations.

SECTION - II

- Q5)** a) Explain TCP prethreaded server with : **[8]**
- i) Per thread accept.
 - ii) Main thread accept.
- b) Many versions of the ping program have a-d flag to enable the SO_DEBUG socket option. What does this do? **[8]**
- Q6)** a) Write a program that prints the default TCP, UDP and SCTP send and receive buffer sizes and run it on the systems to which you have access. **[8]**
- b) Assume two TCP clients start at about the same time. Both set the SO_REUSEADDR socket option and then call bind with the same local IP address and the same local port (say 1500). But, one client connects to 198.69.10.2 port 7000 and the second connects to 198.69.10.2 (same peer IP address) but port 8000. Describe the race condition that occurs. **[8]**
- Q7)** a) Compare the descriptor usage in a server using fork versus a server using a thread, assuming 100 clients are being serviced at the same time. **[8]**
- b) Why does the parent keep the listening socket open instead of closing it after all the children are created? Explain with suitable code. **[8]**
- Q8)** Write Short Notes on : **[18]**
- a) Multicast Socket Options.
 - b) Unicast versus Broadcast.
 - c) Interoperability of IPv6 Client.



Total No. of Questions : 8]

SEAT No. :

P2925

[Total No. of Pages : 2

[4660] - 534

M.E. (Information Technology)

SERVICE ORIENTED ARCHITECTURE (Elective - IV)

(2008 Pattern) (Theory)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:-

- 1) *Answer any three questions from each section.*
- 2) *Question 1 and 5 are compulsory.*

SECTION - I

- Q1)** a) Consider Online music library and model it with SOA. [12]
b) Explain SOA life cycle in detail. [6]
- Q2)** a) Explain Message Exchange Patterns for Enterprise SOA in real time systems. [8]
b) Explain SOAP, WSDL in detail with example. [8]
- Q3)** a) Explain difference between Consumer centric SOA and User Centric SOA. [8]
b) How the implementation of integration pattern will work in SOA? [8]
- Q4)** a) Explain Role of EJB in SOA governance. [8]
b) Write short note on IBM on demand operating environment. [8]

P.T.O.

SECTION - II

- Q5)** a) Consider online railway reservation system, assume suitable constraints and model it with SOA Architecture. [12]
b) Explain SOA security issues and how to address them in detail. [6]
- Q6)** a) Illustrate SOA service registry. [8]
b) Explain role of SOA architect in industry. [8]
- Q7)** a) Explain enterprise solution assets in detail with one example. [8]
b) Explain Business centric SOA in detail. [8]
- Q8)** a) What are the different standards used to implement SOA. [8]
b) Explain impact of changes to services in the SOA lifecycle. [8]



Total No. of Questions : 6]

SEAT No. :

P2926

[Total No. of Pages : 2

[4660] - 557

M.E. (Instru. & Control) (Process Instru.) (Semester - I)

TRANSDUCER DESIGN

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:-

- 1) *Solve any two questions from each section.*
- 2) *Write Section - I and Section - II on separate answer sheet.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Figures to the right candidates indicate full marks.*
- 5) *Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam table is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** Design a temperature measurement system using a J-type thermocouple which must provide an output of 500mV at 200°C. A solid state temperature sensor system will be used to provide reference temperature correction. The sensor has three terminals : supply voltage V_s , output voltage V_T and ground. The output voltage varies as 10mV/°C. (Given : output of J-type thermocouple is 10.78 mV at 200°C with reference to 0°C.) **[25]**
- Q2)** With neat diagram explain piezoelectric transducer design with all required circuit blocks in details. Also mention the importance of each circuit in the same. **[25]**
- Q3)** Design a strain gauge load cell which gives 0 to 1000 mV output for input weight 0 to 100 kg. (Given : output of strain gauge load cell for 100 kg is 5 mV and power supply is $\pm 12V$.) **[25]**

P.T.O.

SECTION - II

- Q4)** Discuss LASER transducer and explain its applications for welding, surface hardening and printing in detail. **[25]**
- Q5)** Explain design of LVDT transducer for linear displacement measurement in which it gives output in the form of DC voltage. **[25]**
- Q6)** List various chemical sensors and explain their applications in details. **[25]**



Total No. of Questions : 6]

SEAT No. :

P2928

[Total No. of Pages : 2

[4660] - 559

M.E. (Instrumentation & Control) (Semester - I)
COMMUNICATION PROTOCOLS FOR INSTRUMENTATION
(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 indicate full marks.*

SECTION - I

Q1) Attempt following :

- a) With neat sketch explain the OSI model in detail with each levels function. [10]
- b) Discuss multidrop Networks of RS - 485 with suitable diagrams. [10]
- c) Explain different types of communication systems in detail. [5]

Q2) Attempt following :

- a) Define open standard communication protocols and explain any two in brief. [10]
- b) Explain crossover and straight cable wiring in Ethernet protocol. [10]
- c) Explain TCP/IP Addressing. [5]

Q3) Attempt following :

- a) With neat diagram explain different levels of the factory communications network. [10]
- b) Explain guidelines used for designing of Fieldbus. [10]
- c) Discuss Fieldbus advantages and limitations in detail. [5]

P.T.O.

SECTION - II

Q4) Attempt following :

- a) Explain Foundation Fieldbus two-level architecture with neat sketch. **[10]**
- b) Describe the different terminologies used in foundation field bus. **[10]**
- c) Write short note on ZigBee wireless protocol. **[5]**

Q5) Attempt following :

- a) Explain the steps involved in calibration of the HART Field devices. **[10]**
- b) Explain Z-wave with any application. **[10]**
- c) Differentiate wireless protocols with other existing protocols. **[5]**

Q6) Attempt following :

- a) Explain Bluetooth based industrial application in detail. **[10]**
- b) Explain HART protocol in detail. **[10]**
- c) Discuss the standards used in communication protocol systems. **[5]**



Total No. of Questions : 8]

SEAT No. :

P2929

[Total No. of Pages : 2

[4660] - 560

M.E. (Instru. & Control) (Process & Biomedical) (Semester - I)

ANALYTICAL INSTRUMENTATION

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Discuss importance of Chemical Analysis and Chemical Analytical Instrumentation. **[10]**
- b) With examples explain Classical and Instrumental methods of chemical analysis? How do you classify Instrumental methods? **[8]**
- Q2)** Explain with a block diagram working of a typical double beam UV - VIS Spectrophotometer. Also compare single beam instrument and double beam instrument. **[16]**
- Q3)** Explain Atomic Emission Spectrometry with various types of excitations. And explain inductively coupled plasma torch. **[16]**
- Q4)** a) What is Auger Electron? Explain one Chemical Analytical method which is based on Auger electron detection. **[8]**
- b) Explain with neat diagram working of Geiger-Muller Counter. **[8]**

P.T.O.

SECTION - II

- Q5)** Explain with neat diagram working of Atomic Absorption Spectrometer. Also explain Back-ground correction in AAS. **[17]**
- Q6)** a) Explain working of GC with neat diagram. Also enlist various GC detectors and Explain any one detector in detail. **[10]**
b) Write a short note on "Pumps used in HPLC". **[7]**
- Q7)** Explain with neat diagram working of Fourier Transform IR Spectrophotometer. What are the advantages of FTIR Spectrophotometer over conventional IR Spectrophotometer? **[16]**
- Q8)** a) What is Chemical shift and Spin-Spin coupling in NMR? Explain with neat diagram working of NMR. **[12]**
b) Calculate slit width and band pass to obtain spectral bandwidth of 0.15 nm with linear reciprocal dispersion of 1.5nm/mm. **[4]**



Total No. of Questions : 6]

SEAT No. :

P2930

[Total No. of Pages : 2

[4660] - 561

M.E. (Instrumentation & Control) (Process Instrumentation)

INDUSTRIAL AUTOMATION

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

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) Discuss in brief with suitable block diagram any four major components of the DCS. Also list and explain the basic functions of DCS system. [25]

Q2) Draw a famous automation hierarchy for an industrial application. Explain the function of each level. [25]

Q3) Write notes on: [25]

- a) Fuzzy Logic based Control.
- b) Model Predictive Control.

SECTION - II

Q4) What is the significance of SPC in Process Plants? Elaborate with the different type of charts used. [25]

P.T.O.

Q5) Describe in brief power plant process. Develop DCS based automation strategy for the power plant control. **[25]**

Q6) Write notes on: **[25]**

- a) Artificial Neural Network.
- b) Interfacing of PLC with SCADA.



Total No. of Questions : 8]

SEAT No. :

P3287

[Total No. of Pages : 2

[4660] - 564

M.E (Biomedical Instrumentation)

**a - FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION
(2008 Course) (Elective - I) (5061201) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1) a)** What is half cell potential of an electrode? Draw and explain the electrical equivalent circuit of two electrodes used for biopotential measurement. **[9]**
- b) List various front panel controls of an ECG recorder and their function. Also state that to which internal block they are related. **[7]**

- Q2) a)** State True or False and Explain: **[12]**
- i) Atrial muscles are stronger than ventricular muscles.
 - ii) Indirect blood pressure measurement technique can record the blood pressure waveform.
 - iii) Application of defibrillator shock is synchronised with ECG.
 - iv) Flow cytometry is used for differential blood cell counting.
- b) Define: **[4]**
- i) Absolute refractory period.
 - ii) Stroke Volume
 - iii) Systole
 - iv) Plethysmography

P.T.O.

- Q3)** a) How the pacemakers are classified? Explain any one of them in detail with the help of a block diagram. [10]
b) Draw and explain various waveforms used for defibrillation. [8]

- Q4)** a) Draw and explain the graph showing different lung volumes and capacities. [8]
b) Explain the principle and working of Doppler blood flow meter with the help of a neat block diagram. [8]

SECTION - II

- Q5)** a) Draw the block diagram of an EEG unit and explain different parts of it. [8]
b) What is 'Auto Analyser'? Explain the important blocks and their working. [8]

- Q6)** a) Develop a time phase diagram showing the correlation of mechanical pumping of heart including opening of valves with the electrical excitation events. [8]
b) Compare Microshock and Macroshock. Explain how the ground fault interrupter is used to identify and indicate the ground shock and how does it work? [8]

- Q7)** a) Name various types of dialysers used for hemodialysis & explain in brief each one of them. [8]
b) Explain shock wave lithotripsy with a detailed block diagram. [8]

- Q8)** a) Enlist various instruments used in Ophthalmology and explain the instrument used for intraocular pressure measurement. [10]
b) Draw and explain the Speech Audiometer with the help of block diagram. [8]



Total No. of Questions : 6]

SEAT No. :

P2931

[Total No. of Pages : 3

[4660] - 566

M.E. (Instrumentation) (Process and Biomedical) (Semester - II)

CONTROL SYSTEM DESIGN

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer two questions from Section - I and two questions from Section - II.
- 2) 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) The open-loop transfer function of unity feedback control system is given:

$$G(s)H(s) = \frac{200K}{s(s+200)}$$

It is desired that $e_{ss} = 1\%$ for unit ramp input and the phase margin $> 45^\circ$. Determine the parameters of the phase lead network to be used for this purpose. Draw the Bode plot for compensated system. [25]

Q2) Obtain approximate PI and PID controllers for the following FOPDT system:

$$G(s) = \frac{0.99e^{-3.6s}}{8s+1}$$

using the direct synthesis approach and given the reference trajectory

$$Q(s) = \frac{e^{-3.6s}}{7s+1}$$

Approximate the dead time using Pade approximation.

[25]

P.T.O.

Q3) Consider the system described by

[25]

$$\dot{X} = Ax + Bu$$

where

$$A = \begin{bmatrix} 0 & 1 \\ 0 & -3 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

The performance index J is given by

$$J = \int_0^{\infty} (x'Qx + u'Ru) dt$$

where

$$Q = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, R = [1]$$

Assume that the following control u is used.

$$u = -Kx$$

Determine the optimal feedback gain matrix K .

SECTION - II

Q4) a) Consider the system

$$x(k+1) = Gx(k) + Hu(k)$$

where

$$G = \begin{bmatrix} 0 & 1 \\ -0.6 & -1 \end{bmatrix}, H = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

Determine a suitable state feedback gain matrix K using Ackermann's formula such that the system will have the closed loop poles at $Z = 0.3 + j 0.4, Z = 0.3 - j 0.4$. [16]

- b) Show that if the desired eigenvalues are all zeros then any initial state $x(0)$ can be brought to the origin in at most n sampling periods and the response is deadbit, provided the control signal $u(k)$ is unbounded. [9]

Q5) A unity feedback system having transfer function [25]

$$G(s) = \frac{K}{s(s+2)}$$

with ZOH. Design a digital lead compensator in the ω plane such that the phase margin is 50° , the gain margin is at least 10dB and K_v is 2 sec^{-1} . Assume sampling period of $T = 0.2$.

- Q6)** a) Write a short note on Model Predictive control. [8]
b) Write a short note on H-infinity design techniques. [9]
c) With an example explain concepts of robust control. [8]



Total No. of Questions : 8]

SEAT No. :

P2932

[Total No. of Pages : 2

[4660] - 567

M.E. (Instrumentation & Control) (Process Instru. & Biomedical Instru.)

ADVANCED SIGNAL PROCESSING

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Write a short note on STFT. Compare DFT and DTFT in the frequency domain. [8]
- b) Explain the necessity of time-frequency analysis with one example. [8]
- Q2)** a) Explain in brief the down-sampler and up-sampler. What is the restriction to decide down-sampling factor (M). [10]
- b) Explain Wigner Distribution. [8]
- Q3)** a) Write a short note on parametric method for power spectrum estimation. [8]
- b) Explain spectral factorization in random processes. [8]
- Q4)** a) Explain the models to represent stochastic - processes. [8]
- b) What are the different applications of power-spectrum estimation? What is its necessity? [8]

P.T.O.

SECTION - II

- Q5)** a) Write a short note on LMS algorithm for adaptive filters. [8]
b) What is Cepstrum? Explain the different properties of Cepstrum. [8]
- Q6)** a) What is homomorphic deconvolution? Explain any one application of homomorphic deconvolution. [8]
b) What is Orthogonal transform? What is the necessity of orthogonal transform? Explain in detail. [10]
- Q7)** a) Explain the concept of Multi-resolution signal analysis with example. [8]
b) Write a short note on video compression standards. [8]
- Q8)** a) What is the Wavelet transform? Explain the scaling function and wavelet functions. [8]
b) Explain digital broadcasting in detail. Also specify the standard sampling frequency used in digital broadcasting. [8]



Total No. of Questions : 8]

SEAT No. :

P2933

[Total No. of Pages : 2

[4660] - 568

M.E. (Instrumentation and Control)

ORGANISATIONAL BEHAVIOUR AND MANAGEMENT

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from Section - I and Section - II.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Discuss the role, functions and skills of industrial management. [9]

b) Describe the functions and activities of manager. [9]

Q2) Explain various models of organizational behaviour and its role to face the challenges and opportunities in business profile. [16]

Q3) Differentiate between personality, emotions and perception. Explain how perception is a key element in individual decision making. [16]

Q4) a) Describe Victor Vroom's Expectancy Theory of Motivation. [8]

b) What is personality? What are its determinants? How it influences work behaviour? [8]

P.T.O.

SECTION - II

Q5) State and explain the concept of organization system. What are its different components? How it brings balance in organization's policies and practices? **[16]**

Q6) What are the various stages of group development? Explain in detail. Describe how group dynamic brings effectiveness in Group decision making process. **[18]**

Q7) Explain conflict management in detail. How conflict resolution takes place in business? Explain contingency approach to conflict management. **[16]**

Q8) Write short notes on:

- a) Human resources policies and practices. **[8]**
- b) Business leadership skills. **[8]**



Total No. of Questions : 6]

SEAT No. :

P2934

[Total No. of Pages : 3

[4660] - 569

M.E. (Instrumentation and Control) (Process Instrumentation)

MODERN CONTROL THEORY

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

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Solve any two questions from each section.
- 2) Figures to the right indicate full marks.

SECTION - I

Q1) Determine the transfer function matrix for MIMO systems given by: [25]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 2 & -1 & 0 \\ 1 & 1 & 2 \\ -1 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} -1 & 0 \\ 1 & 0 \\ 0 & 2 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Q2) Attempt following for a state model with matrix A as: [25]

$$A = \begin{bmatrix} 0 & 2 & 0 \\ 4 & 0 & 1 \\ -48 & -34 & -9 \end{bmatrix}$$

Determine:

- a) Characteristic equation,
- b) Eigen values and,
- c) Eigen vectors.

P.T.O.

Q3) A linear dynamic time invariant systems is represented by

[25]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 2 & -1 & 0 \\ 1 & 1 & 2 \\ -1 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} -1 & 0 \\ 1 & 0 \\ 0 & 2 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Determine the state controllability and observability for above systems.

SECTION - II

Q4) Find the Smith McMillan form of

[25]

$$G(s) = \begin{bmatrix} \frac{1}{s^2 + 4s + 3} & 0 \\ -1 & \frac{2(s+1)^2}{s^2 + 4s + 3} \end{bmatrix}$$

Hence find its poles and zeros.

Q5) For given system discuss on stability by finding K for following cases **[25]**

- a) System without sample-and-hold.
- b) System with sample-and-hold with $T = 0.4$ sec.
- c) System with sample-and-hold with $T = 3$ sec.

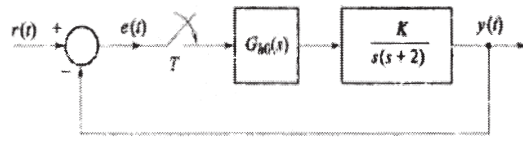


Figure 1: Closed loop sampled data system

Q6) By using the Nyquist criterion, determine whether the closed loop system having the following open loop transfer function is stable or not. If not, how many closed loop poles lie in the right half s-plane. **[25]**

$$G(s)H(s) = \frac{1+4s}{s^2(1+s)(1+2s)}$$



Total No. of Questions : 8]

SEAT No. :

P2935

[Total No. of Pages : 2

[4660] - 572

M.E. (Instrumentation and Control) (Biomedical Instrumentation)

BIO-SIGNAL PROCESSING

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from Section - I and Section - II.*
- 2) *Answer to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Compute the cross-correlation of the sequences **[8]**

$$x(n) = \{2, 3, 4, 1\}, y(n) = \{1, 2, 2, 3\}.$$

b) Compute the linear convolution of the sequences **[8]**

$$x(n) = \{2, 3, 4, 1\}, h(n) = \{1, 2, 2, 3\}.$$

Q2) a) Determine the impulse response of the system described by, **[8]**

$$y(n) = 3y(n - 1) + 2y(n - 2) + x(n).$$

b) Explain the properties of discrete - time Fourier transform (any four). **[8]**

Q3) a) Find the 4-point DFT of $x(n) = \{2, 1\}$. **[8]**

b) Sketch the signal flow graph of 8-point Decimation - In - Time (DIT) algorithm. **[8]**

P.T.O.

Q4) a) Determine and plot the frequency response of the filter response given by, [9]

$$y(n) = x(n + 1) + x(n) + x(n - 1).$$

b) Design the causal linear phase FIR filter for following specifications: [9]

Length $M = 7$.

Cut-off frequency = 2.5 rad/sec.

Window function = Hanning window.

SECTION - II

Q5) a) A filter has poles at $z = -1$ and $z = -2$. Determine the magnitude of its amplitude response at 0.2 rad/sec, 0.3 rad/sec and 0.5 rad/sec. [8]

b) Sketch the pole-zero plot of a filter described by the difference equation,

$$y(n) = y(n - 1) - y(n - 2) + x(n) + x(n - 1). \quad [8]$$

Q6) a) A Butterworth analog filter has the cut-off frequency 0.707 rad/sec and order $N = 3$. Plot the poles on the Butterworth circle. Obtain the transfer function of this analog filter. Using the impulse invariance method, transform this an analog filter $H(s)$ to a digital filter $H(z)$. Assume $T = 1$ sec. [10]

b) Compare the FIR and IIR filters. [6]

Q7) a) What are the main advantages of adaptive filters over fixed filters? Explain in brief any two medical applications of adaptive filtering. [10]

b) Discuss the LMS algorithm in adaptive filtering. [8]

Q8) a) Describe the advantages and disadvantages of modified Huffman coding. [8]

b) What are the various finite word length register effects? Describe the quantization error in detail. [8]



Total No. of Questions : 6]

SEAT No. :

P2936

[Total No. of Pages : 2

[4660] - 574

M.E. (Instru. & Control) (Process Instrumentation)

ADVANCED PROCESS INSTRUMENTATION

(Elective - III (a)) (2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain in brief design steps of feed forward controller for FOPDT process & disturbance transfer functions. Comment on condition for the controller to be realizable. **[15]**

b) Explain with suitable examples limitations to inverting a process model. **[10]**

Q2) Explain with suitable examples (Any Two): **[25]**

- a) Ratio Controller.
- b) Split Range Control.
- c) Selective Control.

Q3) Consider a perfectly mixed stirred tank heater, with single feed stream & a single product stream. Assuming that the flow rate & temperature of the inlet stream can vary, and that the rate of heat added per unit time can vary, **[25]**

- a) Derive the modeling equations for this system. State your assumptions clearly & explicitly.
- b) Derive the transfer function between output temperature and heating rate input assuming heat storage in heater mass to be negligible. Comment on the result.

P.T.O.

SECTION - II

- Q4)** a) Discuss in detail with suitable example, how major categories of control objectives influence the control design. [15]
- b) Explain with suitable block diagram “Internal Model Control”. [10]
- Q5)** Design a cascade control configuration for the shell & tube Heat Exchanger, controlling the outlet stream temperature using steam flow as the manipulated variable. Draw the Instrumentation directly on the figure. Draw a control block diagram, labeling all the signals on the diagram. [25]
- Q6)** Draw a neat schematic diagram of a fuzzy controller. Comment on the specialty of a fuzzy controller, as compared to other control actions. Explain anyone process where fuzzy controller suits the most with justification. [25]



Total No. of Questions : 8]

SEAT No. :

P2937

[Total No. of Pages : 2

[4660] - 577

M.E. (Biomedical Instrumentation) (Semester - II)

BIO-IMAGING MODALITY

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

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) What is radiation? Differentiate the two types of radiation. [8]
- b) Explain why we use different methods of imaging for diagnosis. Explain the typical use of different types of imaging. [8]
- Q2)** a) Explain the block diagram of X-ray machine in detail. [8]
- b) Explain the operation and the applications of X-ray fluroscopic system that is used for real imaging. [8]
- Q3)** a) What is the difference between diagnostic mammography and screening mammography? What is magnification mammography? [8]
- b) Explain the method that overcomes the drawbacks of X-ray imaging system. Explain atleast three image reconstruction methods in the same. [10]
- Q4)** a) What do you mean by CT Number in CT scanning? [8]
- b) List the factors affecting the spacial resolution of the image in CT scan. Explain atleast two factors in detail. [8]

P.T.O.

SECTION - II

- Q5)** a) Explain the different modes in ultrasound imaging system. [10]
b) Explain the relationship of resolution, depth of penetration and frequency in connection with ultrasound image. Explain the advantages and biological effects of ultrasound imaging. [8]
- Q6)** a) Enlist clinical applications of SPECT and give the reason why SPECT is accepted instead of conventional nuclear medical imaging. [8]
b) Discuss various magnets used in MRI to produce appropriate magnetic field. [8]
- Q7)** a) Explain the principle of PET imaging system. Why NaI crystal is popular in nuclear imaging. Which component of PET system makes it costlier system? [8]
b) Draw and explain block diagram of infrared imaging. [8]
- Q8)** a) Explain the basic principle of MR imaging. Enlist advantages of MRI techniques. [8]
b) Explain Medical thermography and the benefits of thermal imaging. [8]



Total No. of Questions : 10]

SEAT No. :

P2938

[Total No. of Pages : 4

[4660] - 580

M.E. (Polymer)

MATHEMATICAL AND STATISTICAL METHODS

(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) Solve the system of equations, using L- U decomposition method. [8]

$$2x + 2y + 3z = 4$$

$$4x - 2y + z = 9$$

$$x + 5y + 4z = 3$$

b) Find the numerically largest eigen value and corresponding eigen vector of the matrix. [9]

$$A = \begin{bmatrix} 4 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

taking initial approximation of the vector as $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$.

Q2) a) Solve the following system of equations by the Gauss-seidel method. [8]

$$10x_1 + x_2 + x_3 = 12$$

$$2x_1 + 10x_2 + x_3 = 13$$

$$2x_1 + 2x_2 + 10x_3 = 14$$

P.T.O.

- b) State Sylvester's theorem and apply it to find $\sin [A]$ [9]

$$\text{Where } A = \begin{bmatrix} 1 & 20 & 0 \\ -1 & 7 & 1 \\ 3 & 0 & -2 \end{bmatrix}.$$

- Q3)** a) Reduce the following matrix to tridiagonal form, explaining the procedure

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix}.$$

[8]

- b) Use Cholesky method to solve the system of equations [8]

$$2x_1 - x_2 = 1$$

$$-x_1 + 3x_2 + x_3 = 0$$

$$x_2 + 2x_3 = 0$$

- Q4)** a) Find the z - transform of the functions: [8]

i) $f(k) = \left(\frac{1}{2}\right)^{|k|}$ for all k .

ii) $f(k) = 2^k \cos(3k + 2), k \geq 0$.

- b) Show that: [8]

i) if $Z\{f(k)\} = F(z)$ then $Z\{k f(k)\} = -Z \frac{d}{dz} F(z)$.

ii) if $Z\{f(k)\} = F(z)$ then $Z\{f(k+n)\} = z^n F(z)$.

Q5) a) i) Find $Z^{-1} \left\{ \frac{1}{\left(z - \frac{1}{2}\right)\left(z - \frac{1}{3}\right)} \right\}, \frac{1}{3} < |z| < \frac{1}{2}$.

ii) Find $Z^{-1} \left[\frac{z^2}{\left(z - \frac{1}{2}\right)\left(z - \frac{1}{3}\right)} \right], \frac{1}{3} < z < \frac{1}{2}$. [8]

b) Find $Z^{-1} \left[\frac{z^3}{(z-1)\left(z - \frac{1}{2}\right)^2} \right]$ by using inversion integral method. [4]

c) Obtain the output of the system, where input is U_k and the system is given by [4]

$$Y_k - 4Y_{k-2} = U_k, \text{ where}$$

$$U_k = \begin{cases} \left(\frac{1}{2}\right)^k, & k \geq 0 \\ 0, & k < 0 \end{cases} .$$

SECTION - II

Q6) a) Using Runge-Kutta method of fourth order, solve the system of equations

$$\frac{dy}{dx} = x + yz, \quad \frac{dz}{dx} = x^2 - y^2$$

taking $x_0 = 0, y_0 = 1, z_0 = \frac{1}{2}, h = 0.2$ to find y and z at $x = 0.2$. [8]

b) Using Modified Euler's method, Solve the equation [9]

$$\frac{dy}{dx} = 1 + xy \text{ with } y(0) = 1, h = 0.1$$

Find y at $x = 0.1$ and 0.2 .

Q7) a) Find the path on which a particle in the absence of friction, will slide from one point to another in the shortest time under the action of gravity. [8]

b) Prove that the Sphere is the solid figure of revolution which for a given surface area, has maximum volume. [8]

Q8) a) Solve the boundary value problem $\frac{d^2y}{dx^2} - y + x = 0, 0 \leq x \leq 1$
 $y(0) = y(1) = 0$ by Rayleigh - Ritz method. [8]

b) Using Galerkin's method, solve the boundary value problem [8]
 $y'' = 3x + 4y; y(0) = 0, y(1) = 1.$

Q9) a) In a city A 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B, 18.5% of a random sample of 1,600 school boys had the same defect. Is the difference between the proportions significant? [8]

b) The figures given below are

- a) the theoretical frequencies of a distribution and
- b) the frequencies of a normal distribution having the same mean, standard deviation and the total frequency as in (a) [8]

(a) 1 5 20 28 42 22 15 5 2

(b) 1 6 18 25 40 25 18 6 1

Apply the χ^2 test of goodness of fit

$$[\chi^2_{6,0.05} = 12.592].$$

Q10) a) A and B play a game of alternate tossing the coin. One who gets head first wins the game. Find the probability of B winning the game if A has a start. [6]

b) A salesman S sells in only three cities, A, B and C. Suppose S never sells in the same city on successive days. If S sells in city A, then the next day S sells in city B. However, if S sells in either B or C, then the next day S is twice as likely to sell in city A as in the other city. Find out how often, in the long run, S sells in each city. [6]

c) Find the unique fixed probability vector \bar{t} of the matrix. [5]

$$A = \begin{bmatrix} 0 & 1/2 & 1/2 \\ 1/3 & 2/3 & 0 \\ 0 & 1 & 0 \end{bmatrix}.$$



Total No. of Questions : 10]

SEAT No. :

P2939

[Total No. of Pages : 2

[4660] - 582

M.E. (Polymer Engineering)

POLYMER PROCESSING AND TESTING

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Question Number 1 & 6 are compulsory. Out of the remaining attempt 2 questions from Section - I & 2 questions from Section - II.
- 2) Draw neat diagrams wherever necessary.
- 3) Numbers to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of logarithmic table, electronic pocket calculators is allowed.

SECTION - I

- Q1)** a) Discuss in detail Transient Mechanical Test Measurements which can be used to characterize the dimensional stability of a polymeric material. [14]
- b) Explain with Fatigue Curve importance of Fatigue test. [6]
- Q2)** a) Explain with applicable Tensile Stress-strain curves different types of polymeric materials and give one example of each type. [5]
- b) Explain in detail Craze and Shear banding mechanism of deformations. [10]
- Q3)** a) Explain effect of polarity, crystallinity and degree of cross linking on the Modulus-Temperature relationship for polymeric materials. [6]
- b) Write a note on Dielectric Constant. Dielectric Strength and Arc resistance Measurement. [9]
- Q4)** Write a note on: [15]
- Ductility Ratio.
- Test For Fire Response Characteristics.
- Environmental Stress Cracking.

P.T.O.

- Q5)** a) Discuss any two Non-destructive test methods with one example. [6]
b) Explain with one test method importance of barrier properties. [9]

SECTION - II

- Q6)** a) Explain the process, application of Reactive Extrusion in details. [12]
b) Discuss in detail reaction Injection Molding. [8]

- Q7)** a) Explain with neat sketch of Pipe Extrusion line using Vacuum Sizing. [6]
b) Explain with neat diagram Tubing Extrusion die equipped with internally cooled sizing mandrel. Explain most important design consideration used in designing Tube and Pipe Dies. [9]

- Q8)** a) Explain with neat diagrams dies used for Profiles. [7]
b) Explain in detail any two processes used in Thermoforming. [8]

- Q9)** Write a short note: [15]
a) Parison Programming.
b) Downstream Equipments and Auxiliary Units For Film extrusion Lines.

- Q10)** Explain in detail the following for counter rotating Twin Screw: [15]
Extruders.
Feeding.
Melting.
Mixing.
Venting.
Pumping.
Residence time.
Power Consumption.



Total No. of Questions : 8]

SEAT No. :

P2940

[Total No. of Pages : 2

[4660] - 583

M.E. (Polymer) (Semester - I)

POLYMER REACTION ENGINEERING

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

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Question number 1 & 5 are compulsory. Out of the remaining attempt 2 questions from Section - I & 2 questions from Section - II.
- 2) Draw neat diagrams wherever necessary.
- 3) Numbers to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of logarithmic table, electronic pocket calculators is allowed.

SECTION - I

- Q1) a)** In step growth polymerization single-parameter distribution function in terms of degree of polymerization (DP) is given by
$$W_{DP} = DP (\ln p)^2 p^{DP}$$
 Where, DP = Degree of polymerization and p = Fractional monomer conversion.
Find number average and weight average degree of polymerization. [4]
- b)** Explain with one example "Effect of Molecular weight Distribution on properties".
A polydisperse sample of polymer is prepared by mixing three monodisperse samples in following proportions: [14]
1gm - 10,000 molecular weight
2gm - 50,000 molecular weight
2gm - 1,00,000 molecular weight
Find number average and weight average degree of polymerization and PDI of the sample.
- Q2) a)** Explain with three different ways how to control molecular weight in step growth polymerization and also list various conditions and corresponding mechanism which acts as the rate determining step. [12]
- b)** Explain the different mechanism steps for Free Radical Polymerization. [4]

P.T.O.

Q3) Explain the following quantities to be used in the Characterization of Long Chain Molecules: [16]

- i) Weight Fraction,
- ii) First moment of P_j 's
- iii) Number Average Degree of Polymerization
- iv) Weight Average Degree of Polymerization
- v) Number Average Molecular Weight
- vi) Weight Average Molecular Weight

Discuss the mechanism of Ionic polymerization and derive the necessary expression for Instantaneous Fractional Degree of Polymerization and Instantaneous weight Degree of Polymerization by using Ionic polymerization.

Q4) a) Describe with neat diagram role of Critical Micelles Concentration. [6]
b) Write a note on Co-ordination polymerization [10]

SECTION - II

Q5) Discuss important microstructure features of emulsion polymers and their effects on the properties. Explain mechanisms involved in emulsion polymerization and kinetics of emulsion polymerization. [18]

Q6) a) Write a note on Scale of Suspension Polymerization reactors. [8]
b) Explain in detail Metallocene based Polymerization for olefins. [8]

Q7) a) Discuss in detail Suspension Polymerization Reactor with one recipe for polymer production. [10]
b) Explain with neat process diagram PP production. [6]

Q8) Write a short note : [16]
a) Control engineering in polymerization process.
b) Industrial Olefin Polymerization Reactor.



Total No. of Questions : 10]

SEAT No. :

P2941

[Total No. of Pages : 2

[4660] - 586

M.E. (Polymer) (Semester - I)

POLYMER RHEOLOGY

(2008 Pattern) (Elective - II (a))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Question number 1 & 6 are compulsory. Out of the remaining attempt 2 questions from Section I and 2 questions from Section II.
- 2) Draw neat diagrams wherever necessary.
- 3) Numbers to the right indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of logarithmic table, electronic pocket calculators is allowed.

SECTION - I

- Q1)** a) Explain in detail Elastic Effect in Polymer Melts. [10]
b) Explain with neat diagram Isochronous Stress-strain plot. [5]
c) Discuss in detail Classification of Fluids. [5]
- Q2)** Explain in detail Analysis of Flow through Pipe by using Power Law and Ellis Model. [15]
- Q3)** a) Explain in detail Constitutive Equations. [10]
b) Write a note on Tensor Notation System used in Flow analysis. [5]
- Q4)** a) Explain Turbulent Flow analysis of Non-Newtonian Fluids. [10]
b) Explain Turbulent Damping. [5]
- Q5)** a) Explain characteristics of Extensional Flow with examples. [6]
b) Explain in detail Simple Extensional Viscosity with examples. [9]

P.T.O.

SECTION - II

- Q6)** Explain in detail Static Stress Relaxation. Static Creep Behaviour, Dynamic Stress Relaxation and Dynamic Creep Behaviour by Maxwell and Vigot-Kelvin Model. [20]
- Q7)** a) Explain in detail The Rouse Theory and Doi-Edwards Theory to predict the rheological properties of high molecular weight polymers. [9]
b) Write a note on Nonlinear Viscoelasticity. [6]
- Q8)** a) Explain with applicable diagrams effect of Temperature on different viscoelastic functions. [7]
b) Explain in detail Effect of Molecular parameters on rheological behaviour of polymer melts and solutions. [8]
- Q9)** Write a short note : [15]
a) Normal Stress Difference Measurement
b) Torque Rheometers
- Q10)** a) Explain in detail Capillary Tube Viscometer. [8]
b) Write a note “Dynamic Measurement under Oscillatory Flow”. [7]



Total No. of Questions : 10]

SEAT No. :

P2942

[Total No. of Pages : 2

[4660] - 589

M.E. (Polymer Engineering)

POLYMER PHYSICS AND CHARACTERIZATION

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Question number 1 & 6 are compulsory. Out of the remaining attempt 2 questions from Section I & 2 questions from Section II.
- 2) Draw neat diagrams wherever necessary.
- 3) Numbers to the right indicate full marks.
- 4) Assume suitable data. if necessary.
- 5) Use of logarithmic table. electronic pocket calculators is allowed.

SECTION-I

- Q1)** a) Explain in detail Thermodynamics of Polymer Solutions with applicable theoretical model. [15]
b) Explain with neat diagram dependency of Gibbs Free energy on polymer solution composition as constant temperature. [5]
- Q2)** a) Discuss in detail Intrinsic Viscosity-Molecular Weight Relationship. [7]
b) Explain how to predict solubility Parameters with one example and discuss effect of branching on the Intrinsic Viscosity of polymer solution. [8]
- Q3)** a) Explain significance of Creep Master curve. [6]
b) Write a note on Dynamic - Mechanical Analysis. [9]
- Q4)** a) Explain suitable technique to measure Surface Tension and contact Angle Measurements. [8]
b) Explain any one method to study polymer degradation. [7]
- Q5)** a) Write a note on "Crystallization Kinetics". [6]
b) Explain in detail X-Ray Diffraction with one example. [9]

P.T.O.

SECTION - II

- Q6)** Explain in detail with applicable diagram Gel Permeation Chromatography and also explain with Universal GPC Calibration Curve. [20]
- Q7)** a) Explain frequency dependency of Dielectric constant and loss. [7]
b) Explain with neat diagram applications of DSC measurements. [8]
- Q8)** a) Explain how to determine tacticities by NMR Spectra. [7]
b) Explain in detail working of Fourier transform Infrared spectroscopy. [8]
- Q9)** Write a short note [15]
a) Normal Stress Difference Measurement
b) Elongational Viscosity Measurement
- Q10)** a) Explain in detail influence of any three parameters on viscoelastic properties of polymers. [7]
b) Write a note on Scanning Electron Microscopy. [8]



Total No. of Questions : 10]

SEAT No. :

P3387

[4660]-591

[Total No. of Pages : 3

M.E. (Polymer Engineering)

PROCESSING AND MECHANICS OF COMPOSITES

(2008 Pattern) (509124)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Questions 1 and 6 are compulsory. From the remaining, solve any 2 from section I and section II.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Indicate which elements of compliance matrix are responsible for. [6]
- i) Extension - extension coupling.
 - ii) Shear extension coupling.
 - iii) Shear - Shear coupling.
 - iv) Pure shear and pure extension.
- b) Discuss the process parameters of pultrusion process control. [6]
- c) Prove restriction on values of Poisson's ratio isotropic material. [4]
- d) Write in short about the bounding techniques of linear elasticity to examine the bounds on moduli of multiphase systems. [2]
- Q2)** a) For an Orthotropic material with plane stress condition following are the Engineering constants. Find off-axis Young's modulus at 45°. [4]
- $E_1 = 145 \text{ GPa}; E_2 = 60 \text{ GPa}; G_{12} = 10 \text{ GPa}; \nu_{12} = 0.3.$
- b) State the maximum stress theory for orthotropic material with plane stress condition and reduce it to uniaxial case. [6]

P.T.O.

- c) Prove that reduced transformed stiffness matrix in terms of transformation matrix given by, $[\bar{Q}] = [T]^{-1} [Q] [T^T]^{-1}$ [6]
- Q3)** a) Show that for equal strength in compression and tension Hoffman's criteria reduces to Tsai - Hill criteria. [6]
- b) What is the importance of invariant properties as defined by Tsai and Pagano? [6]
- c) Write in short about compressive strength of composite in fiber direction and explain the extensional mode and shear mode of fiber buckling. [4]
- Q4)** a) Obtain an expression for 4th order tensor defined in Tsai - Wu criteria using a biaxial test. [6]
- b) Obtain an expression for E_x i.e. Young's modulus in global direction in terms of engineering constants in case of orthotropic material. [6]
- c) Explain Polar winding with reference to Filament winding. [2]
- d) Define coefficient of mutual influence of the first kind. [2]
- Q5)** a) Prove the rule of mixture for Elastic Modulus in the direction of fibers (E_1). [6]
- b) Discuss the importance of accurately predicting the factor ξ depending on the fiber geometry / packing geometry / fiber loading condition. [6]
- c) Write short note on any one type of thermoplastic fiber used in composites. [4]

SECTION - II

- Q6)** a) If engineering constants of an lamina are given by, [6]
- $E_1 = 250 \text{ GPa}; E_2 = 150 \text{ GPa}; G_{12} = 5 \text{ GPa}; \nu_{12} = 0.25.$
- Calculate [A], [B] and [D] matrices for $[+60/-60]_s$ symmetric laminate.

- b) If engineering constants of a lamina are- [6]
 $E_1 = 200 \text{ GPa}$; $E_2 = 75 \text{ GPa}$; $G_{12} = 5 \text{ GPa}$; $\nu_{12} = 0.3$.
 Calculate the [A], [B] and [D] matrices for a single layer specially orthotropic lamina.
- c) What is a non - symmetric laminate? Give one example with stacking sequence. [6]
- Q7)** a) Discuss the strain gauge arrangement for used in two rail shear test and explain how shear modulus can be determined by this test. [6]
- b) Discuss the strain gauge arrangement in a 10° off-axis test and explain how shear modulus can be determined. [6]
- c) Draw a fixture of edgewise sandwich beam test for determination of compression properties. [4]
- Q8)** a) Define and discuss anti-symmetric laminates. State force and moment relationships. [6]
- b) Explain any one technique of non-destructive testing used for composites. [6]
- c) Describe three point bending test method. [4]
- Q9)** a) Obtain an expression for deflection of a symmetric laminated beam simply supported at both ends and subjected to uniform load in terms of elements of [A], [B] and [D] matrix. [8]
- b) Discuss stepwise procedure for design of an automotive drive shaft. [8]
- Q10)** a) Discuss pin bearing properties and failure modes. [8]
- b) Discuss design steps for Ply-by-Ply failure of a laminate. [8]



Total No. of Questions : 6]

SEAT No. :

P2943

[Total No. of Pages : 3

[4660] - 598

M.E.(Printing) (Semester - I)

PROBABILITY, STATISTICS & QUEUING THEORY

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Answer any two questions from each section.*
- 2) *Answer to two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of calculator is permitted.*
- 5) *Use of statistical data table is permitted.*
- 6) *Figures on right indicate marks.*

SECTION - I

- Q1) a)** If 5% of electric bulbs manufactured by company are defective use poisson distribution to find probability that in a box of 100 bulbs. **[15]**
- i) None is defective.
 - ii) 3 bulbs are defective
 - iii) More than 3 bulbs are defective (given $e^{-5} = 0.077$).
- b) 10 unbiased coins are tossed simultaneously find probability that there will be. **[10]**
- i) Exactly 5 heads
 - ii) Atleast 8 heads
 - iii) Atleast one head
 - iv) Not more than 3 heads
 - v) If this exercise is carried 50 times how many times we can get 5 heads exactly.

Given $r = 0.9$, $\sum xy = 70$, $\sigma_y = 3.5$, $\sum x^2 = 100$

Find the number of items x & y are deviation from arithmetic mean.

P.T.O.

- Q2) a)** Obtain equation of lines of regression & obtain an estimate of y which should correspond on average to $x = 6.2$ [15]

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

- b) A machine which produces mica insulating washers used in electric device is set to turn out washers of thickness of 10mm. A sample of 10 washers has average thickness of 9.52 mm with standard deviation of 0.60 mm. Test of sample is drawn from correctly (trial = 2.26) [10]

- Q3) a)** Is the following statement true? [10]

Give reason : $40x - 18y = 5$ & $8x - 10y + 6 = 0$ are respectively the regression equations of x on y and y on x .

- b) Random variable x has following probability function. [15]

Value of $X(x)$	0	1	2	3	4	5	6	7
$P(x)$	0	k	$2k$	$3k$	$3k$	k^2	$2k^2$	$7k^2+1$

- i) Find k
 ii) Evaluate $P(x < 6)$, $P(x \geq 6)$ & $P(0 < x < 5)$
 iii) $P(x \leq x) > \frac{1}{2}$ find minimum value of x .
 iv) Determine distribution function of x .

SECTION - II

- Q4) a)** From the following bivariate probability distribution function of x & y find. [15]

- i) $P(x \leq 1, y = 2)$ ii) $P(x \leq 1)$
 iii) $P(y = 3)$ iv) $P(y \leq 3)$
 v) $P(x < 3, y \leq 4)$

x/y	1	2	3	4	5	6
0	0	$1/32$	$2/32$	$2/32$	$2/32$	$3/32$
1	$1/16$	$1/16$	$1/8$	$1/8$	$1/8$	$1/8$
2	$1/32$	$1/32$	$1/64$	$1/64$	0	$2/64$

- b) The probability of ship being destroyed at a certain voyage is 0.02. The company owns 6 ships for voyage. What is probability for : **[10]**
- i) Loosing one ship.
 - ii) Loosing 2 ships.
 - iii) Loosing none.

Q5) a) Explain the following control charts. **[10]**

- i) X chart
- ii) R chart
- iii) C chart

b) Write about statistical methods in improving quality for products & industries. **[15]**

Q6) a) Explain Kndall's Notation What are littles formulae. **[10]**

b) Arrivals at a telephone booth are considered to be Poisson with average time of 10 minutes. What is probability that person. **[15]**

- i) Arriving at booth will wait.
- ii) Average length of queue.
- iii) Average waiting time in que.



Total No. of Questions: 6]

SEAT No. :

P2945

[Total No. of Pages : 1

[4660] - 600

M.E.(Printing Engineering and Graphic Communication)

MODERN TRENDS IN PRINTING

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any two questions from each section.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Draw neat diagram wherever necessary.*
- 4) *Figures to right indicate full marks.*

SECTION - I

- Q1)** a) Explain in detail effect of process parameters on offset printability. [15]
b) Mention the benefits of Offset and Digital printing process. [10]
- Q2)** a) Explain in detail inking system for flexo. [10]
b) Explain the making of flexo plate. [15]
- Q3)** a) Explain in detail Gravure cylinder engraving process. [15]
b) Describe the unit configuration of a gravure press. [10]

SECTION - II

- Q4)** a) Explain the impact of nip pressure on print quality. [10]
b) Explain pressurization methods of an impression roller. [15]
- Q5)** a) Mention the pneumatic systems on web press. [10]
b) Explain in detail ELS system for a press. [15]
- Q6)** a) Explain the factors that govern ink transfer on a gravure press. [15]
b) Mention the safety precautions to be considered for PP plate. [10]



Total No. of Questions : 6]

SEAT No. :

P2946

[Total No. of Pages : 2

[4660] - 602

M.E. (Printing Engg. and Graphic Communication)
B : PRINTING AND PACKAGING MATERIALS
(2008 Pattern) (Elective - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION-I

- Q1)** a) Explain materials used for pre-press films, plates, chemicals and light sources. [9]
b) Explain the workflow of Gravure Cylinder preparation. [16]
- Q2)** a) Write comment on substrate-ink interaction and its effect on printability.[9]
b) Discuss properties and application of various polymer substrates. [16]
- Q3)** a) Explain the identification tests for polyethylene. [16]
b) State various factors used for substrate selection of package. [9]

SECTION - II

- Q4)** a) Mention following tests for a substrate: (Any Four) [16]
i) Folding Endurance
ii) Tensile Strength
iii) Scratch proof test
iv) COF
v) Modulus of elasticity
b) Explain in detail end use application tests for a package. [9]

P.T.O.

- Q5)** a) Write in detail ink composition of paste inks. [9]
b) Explain various types of vehicles used in printing process. [8]
c) What is dyne level? Give the range of dyne level for good printability. [8]
- Q6)** a) Explain in detail Ink Rheology of liquid inks. [13]
b) State the causes and remedies of the following: (any two) [12]
i) Mottling
ii) Striations
iii) Improper Adhesion of Ink and substrate



Total No. of Questions : 6]

SEAT No. :

P2947

[Total No. of Pages : 2

[4660] - 603

M.E.(Printing Engineering and Graphic Communication)

DESIGN OF EXPERIMENT & RESEARCH METHODOLOGY

(2008 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

Q1) Answer the following :

- a) Define Research and explain different types of Research. [15]
- b) Describe various Approaches of Research. [10]

Q2) Answer the following :

- a) List down the importance of Literature review in Research task. [15]
- b) Write a short note on Motivation in Research. [10]

Q3) a) Explain the process of formulation of model based on simulation? [15]

- b) How do you define research problem? List down characteristic of good research problem. [10]

SECTION - II

Q4) Answer the following :

- a) Describe the various guidelines for Designing Experiment. [15]
- b) Explain the Taguchi Approach in Parameter Design. [10]

P.T.O.

- Q5)** a) Describe features of Response surface Design. [15]
b) Explain in detail formulation of Research Task with Printing Application. [10]
- Q6)** a) Describe various types of Reports in detail. [15]
b) What are the factors to evaluate the Research Report. [10]



Total No. of Questions : 6]

SEAT No. :

P3460

[Total No. of Pages : 2

[4660] - 604
M.E. (Printing Engineering)
DIGITAL PRINTING
(2008 Pattern) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer all questions.*
- 2) *Figures to the right indicate full marks.*

Q1) What is Digital Image resolution? Explain selection of Digital Image resolution with respect to printing requirements. **[18]**

OR

Describe critical properties of Bitmap and Vector Images.

Q2) Explain compressible / non-compressible types of file formats. **[16]**

OR

Explain RAW file format in detail with properties.

Q3) Explain in detail structure & working of a DIGITAL SENSOR CAMERA. **[16]**

OR

Compare between types of digital sensors in detail.

Q4) Explain lonography printing processes with applications. **[18]**

OR

Describe :

- a) Thermal Printing
- b) Inkjet wide format in detail

P.T.O.

Q5) Explain how Variable data printing works. **[16]**

OR

Explain Print on Demand concept.

Q6) State future scenario of printing industry in view of digital printing. **[16]**

OR

Explain parameters in costing of Digital printing jobs.



Total No. of Questions : 6]

SEAT No. :

P3459

[Total No. of Pages : 2

[4660] - 605

M.E. (Printing Engineering)

ENTREPRENEURSHIP IN PRINTING & ALLIED FIELDS

(2008 Pattern) (Elective - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

1) All questions are compulsory.

Q1) What is Entrepreneurship? Explain factors deciding success and failure of a entrepreneurship. **[18]**

OR

Describe business idea and creativity with examples.

Q2) Explain Innovation theory by Schumpeter. **[16]**

OR

Explain Theory of Social change by Everett Hagen.

Q3) Explain Important Aspects of Production management. **[16]**

OR

Explain Technical and economical feasibility of project & project report preparation.

Q4) Explain elements of Customer relationship management. **[18]**

OR

Explain Product life cycle concept in detail.

P.T.O.

Q5) Explain role of state and central government in entrepreneurship policies. **[16]**

OR

Explain role of government agencies in entrepreneurship.

Q6) Writes note on any two : **[16]**

- a) Sale of goods act.
- b) contract act.
- c) Negotiable instrument act.

OR

Explain Basic of accounting, profit & loss, Balance Sheet preparation.



Total No. of Questions : 6]

SEAT No. :

P2948

[Total No. of Pages : 2

[4660] - 606

M.E.(Printing Engineering and Graphic Communications)

QUALITY CONTROL SYSTEMS AND PRODUCTIVITY

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

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Explain the workflow from pre-press to post-press of Flexo process. [8]
b) Explain the workflow from pre-press to post-press of Offset process. [8]
c) Explain the process variables in printing. [9]
- Q2)** a) Write note on need for standardization. [10]
b) Explain different standards followed in printing industry and how these standards are implemented. [15]
- Q3)** a) Explain in detail Quality Control aids for printability. [9]
b) Write notes on (any four) [16]
i) Trakatron Line.
ii) Auto Registration Marks.
iii) CIE LAB.
iv) Trap.
v) Contrast.

P.T.O.

SECTION - II

- Q4)** a) Explain the quality challenges with respect to printing industry. [15]
b) Explain the implementation of Quality Management System for a Press. [10]
- Q5)** a) Write notes on : (Any two) [9]
i) Types of Variation.
ii) SPC.
b) Discuss use of Control charts for Print application. [16]
- Q6)** Write in detail about process analysis in printing. [25]



Total No. of Questions :6]

SEAT No. :

P3388

[4660]-607

[Total No. of Pages :1

M.E. (Printing)

PRINT MEDIA COMMUNICATIONS

(2008 Course) (Semester - II) (508108)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*

SECTION - I

- Q1)* “Designing also can take disciplined approach”- Justify. [16]
- Q2)* Surface design affects layout to a greater extent - Justify. [16]
- Q3)* How does texture of paper and plastic affect the design. Explain. [18]

SECTION - II

- Q4)* What are the latest trends in typography & illustration. Explain with suitable case study. [16]
- Q5)* What is modern newspaper design concept? Explain in greater details. [18]
- Q6)* Cover designs sell the book - Justify. [16]

EEE

Total No. of Questions : 6]

SEAT No. :

P2949

[Total No. of Pages : 2

[4660] - 609

M.E.(Printing Engineering and Graphic Communication)

SUBSTRATES AND INKS

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Explain in detail paper making processes with adequate diagrams. [13]
b) Comment on Different types of paper & plastic substrates used for printing. [12]
- Q2)** a) State mechanical properties of paper? Elaborate measuring methods.[13]
b) Explain ASTM and TAPPI standards for boards. [12]
- Q3)** a) What are the drying Mechanisms used in printing. [13]
b) Give typical formulation of water based Gravure printing ink for paper. [12]

SECTION - II

- Q4)** a) Write in detail about inkjet inks. [10]
b) Write notes on (Any Three) : [15]
i) Fluorescent inks.
ii) Electrographic inks.
iii) Metallic inks.
iv) Water based inks.

P.T.O.

- Q5)** a) Write in detail about the elements of cost estimation. [10]
b) Calculate the total quantity of paper required in the size 45.5×58.5 cms for printing monthly magazine 500 copies in the size $210 \text{ mm} \times 297 \text{ mm}$ assuming the magazine contains 32 pages. [15]
- Q6)** a) What is FSC? What do you mean by '**Going Green**'? [13]
b) Comment on VOC and its significance in printing inks. [12]



Total No. of Questions : 6]

SEAT No. :

P2950

[Total No. of Pages : 2

[4660]-610

M.E. (Printing and Graphic Communication) (Theory)
MULTIMEDIA SYSTEMS AND COMMUNICATION
(Elective - III (A)) (2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any two questions from Section-I and any two questions from Section-II*
- 2) *Answers to the two sections should be written in separate answer 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 the emerging trends in multimedia systems. [10]
b) Explain the following terms related to future television graphics. [15]
i) HDTV
ii) Virtual Set Environment
iii) Graphic Centralization
- Q2)** a) 'Encapsulation, Inheritance and Polymorphism are main pillars of OOPs', Justify it with proper example. [10]
b) Explain in brief the following Image Editor features : [15]
i) Histogram
ii) Sharpening and Softening of Images.
iii) Contrast change and Brightening.
- Q3)** a) Explain in brief JPEG and MPEG Standards for Multimedia applications. [10]
b) What are the recent technologies used for computer monitors? Explain in brief 'SED Display' and 'TFT-LCD Display' technologies. [15]

P.T.O.

SECTION - II

- Q4)** a) List various audio, video & animation authoring tools. Explain one tool in detail. **[10]**
- b) What are different Animation Issues? Explain in brief how different Animation issues can be handled? **[15]**
- Q5)** a) Justify the statement : 'A stand-alone Internet radio devices emerged to Offer listeners a no-computer option for listening to audio streams'. **[10]**
- b) Explain in detail the Social Criticism and Cultural Impact of Online Chat and Online Shopping. **[15]**
- Q6)** a) What is 'Web Search engine'? With the help of simple block schematic explain the working principle of 'Web Search engine'. **[10]**
- b) Write short notes on (Any three) : **[15]**
- i) Bookmarks
 - ii) Camera Raw.
 - iii) Metadata & Asset Management.
 - iv) Programming Languages for web page creation.



Total No. of Questions : 6]

SEAT No. :

P2951

[Total No. of Pages : 2

[4660]-611

M.E. (Printing Engg.) (Semester - II)

B : TOTAL PRODUCTIVE MAINTENANCE IN PRINTING
(2008 Pattern) (Elective - III)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any two questions from each section.*
- 2) Answer to two sections should be written in separate sheets.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Use of calculator is permitted.*
- 5) Use of statistical data table is permitted*
- 6) Figures to right indicate full marks.*

SECTION - I

Q1) a) Describe various stages of implementing TPM. [15]

b) Describe pneumatic system maintenance. [10]

Q2) a) Describe various lubrication standards. [15]

b) Write short note on Autonomous management. [10]

Q3) a) Describe various techniques for improving process. [15]

b) Write short note on Brainstorming. [10]

P.T.O.

SECTION - II

- Q4)** a) Explain periodical maintenance. [15]
b) List down various stages in evaluation of planned maintenance. [10]
- Q5)** a) Describe various statistical process control tools. [15]
b) Explain various types of control charts. [10]
- Q6)** a) Explain the function of safety & health department in any office. [15]
b) Explain the importance of training & education to office staff. [10]



Total No. of Questions : 6]

SEAT No. :

P2952

[Total No. of Pages : 2

[4660]-612

M.E. (Printing Engg. & Graphic Communication) (Semester - II)

PRESS FINGER PRINTING

(Elective - III) (2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

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

SECTION - I

- Q1)** a) Explain Characterization and Optimization in Printing. [10]
b) Discuss benefits of Press Standardization in detail. [15]
- Q2)** a) What are variables considered for Flexo Press Optimization. [10]
b) Write Notes on. [15]
i) Hue Error
ii) Grey Balance
iii) Color Variation
- Q3)** a) State and Explain the test forms and instruments required for press finger printing. [16]
b) Discuss about the viewing conditions. [9]

P.T.O.

SECTION - II

- Q4)** a) Comment on ICC Profiling. [16]
b) State and Explain Standardization essentials. [9]
- Q5)** a) Write Notes on. [12]
i) White Point of Substrates
ii) Bump Curves and their application
b) Explain Profile Editing. [13]
- Q6)** a) Explain use of Statistical techniques sample analysis. [13]
b) Write note on Short – Term and Long – Term Variation. [12]



Total No. of Questions : 6]

SEAT No. :

P2953

[Total No. of Pages : 2

[4660]-614

M.E. (Printing Engineering & Graphic Communication)

B : ADVANCES IN CONVERTING AND PACKAGING

(Elective - IV) (2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any two questions from each section.*
- 2) *Answer to two sections should be written in separate books.*
- 3) *Draw neat diagram wherever necessary.*
- 4) *Figures to right indicate full marks.*

SECTION - I

Q1) a) Explain the finishing process for a product. **[15]**

b) State the security features in Packaging. **[10]**

Q2) a) Explain the finishing techniques used for publication. **[15]**

b) Explain the need and importance of Varnishing in packaging. **[10]**

Q3) a) Explain along with diagram Dry Lamination technique. **[15]**

b) Explain along with diagram Wet Lamination technique. **[10]**

P.T.O.

SECTION - II

- Q4)** a) Explain in detail extrusion process for film manufacturing. [15]
b) Describe stretch and shrink packaging. [10]
- Q5)** a) Explain in detail Bag-in-Box for solid products. [15]
b) Explain the role of Poly ethylene terephthalate bottle packaging. [10]
- Q6)** a) Explain in detail Aseptic Packaging. [15]
b) Explain in detail Boil-in-Bag packaging. [10]



Total No. of Questions : 6]

SEAT No. :

P2954

[Total No. of Pages : 2

[4660]-615

M.E. (Printing Engg. & Graphic Comm.) (Semester - II)

ANALYSIS OF SPOT AND PROCESS INKS

(Elective - IV) (2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any two questions from each section.*
- 2) *Answers to two sections should be written in separate books.*
- 3) *Draw neat diagram wherever necessary.*
- 4) *Figures to right indicate full marks.*

SECTION - I

- Q1)** a) Explain in detail water inks. [8]
b) Explain in detail solvent inks. [9]
c) Explain in detail specialized inks. [8]
- Q2)** a) Describe the role of resins used in flexo inks. [9]
b) Explain in detail rheology of solvent based of flexo inks. [9]
c) Mention the purpose of additives in water based flexo inks. [7]
- Q3)** a) Explain the flow property of Acrylic inks. [8]
b) Explain the use of diluents on gravure print quality. [9]
c) Explain the effect corona treatment on ink transfer. [8]

P.T.O.

SECTION - II

- Q4)** a) Mention the function of additives in Offset inks. [10]
b) Mention the role of pigments in Offset inks. [15]
- Q5)** a) Explain the effect of solid to solvent ratio in an ink on print quality. [10]
b) Proofing is a inevitable. Explain [15]
- Q6)** a) Explain the impact of printing process parameters on dot fidelity. [15]
b) Explain the relation between cell geometry and ink transfer. [10]

