Total No. of Questions : 8]

SEAT No. :

P4004

[Total No. of Pages : 3

[5255]-501

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

APPLICATIONS OF STATISTICAL METHODS IN CONSTRUCTION

(2013 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 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) In a bolt factory machines A, B and C manufacture respectively 25%, 35%, and 40% of the total of their output 5, 4, 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B and C? **[6]**

b) With practical examples explain the various quality control tools. **[4]**

Q2) A tenderer is bidding for construction work average the 10 numbers in a year for the last 5 years. Find the probability that; **[10]**

a) He gets atleast 6 works

b) He gets exactly 4 works

c) He does not get any work

d) He gets more not than 3 works

e) He gets all the works.

Q3) a) Explain the following: **[6]**

i) Binomial Probability distribution

ii) Normal Probability distribution

b) Explain queuing theory applications for optimizing the use of equipment in a RMC plant, with a proper example. **[4]**

P.T.O.

Q4) a) The following table shows the average precipitation in a city for month of August during the years 1990-1999. **[6]**

Years	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Precipitation (in)	6.2	7.3	4.4	3.2	2.1	3.6	4.5	3.6	2.3	5.1

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

b) Explain the significance of partial correlation coefficient. **[4]**

Q5) Find coefficient of correlation for the following. Also interpret the same. **[8+2]**

X	88	56	51	45	59	65	70	73	68	70
Y	72	65	51	42	65	69	62	70	63	72

Q6) a) Explain multiple regression equation with more than 3 variables in quality of precast segment delivered from casting yard to site. **[6]**

b) Explain the applications of ABC analysis in material management. **[4]**

Q7) You are project manager on construction project. Your project required 1 lakh cement bags annul. Basic unit price of cement bag inclusive of taxes, handling, and transportation to project site location is Rs. 300/bag. The ordering cost is Rs. 2000/order. Inventory carrying cost is 20% of average annual inventory. Based on activities scheduling monthly required cement bags are as follows.

Months	Jan	Feb	Mar	April	May	June
Cement Bags	4000	6000	8000	10000	12000	16000

Months	July	Aug	Sept	Oct	Nov	Dec
Cement Bags	13000	11000	8000	6000	4000	2000

Consider under stocking cost 3% of total cost of cement bags causing understock and overstocking cost 4% of total cost of cement bags causing overstock. Determine the total cost by six monthly model for above given data. **[10]**

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

Project No.	Project Cost in Lakhs
1	25
2	10
3	3
4	9
5	16

Use the following random numbers.

20 85 59 72 88 11 89 87 59 66 53 45 56 22 49

Total No. of Questions : 8]

SEAT No. :

P4005

[Total No. of Pages : 2

[5255] - 502

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

MANAGEMENT AND PROJECT PLANNING IN CONSTRUCTION

(2013 Course) (501022) (Semester - I) (End Semester)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) What is scientific management? **[4]**

b) Describe following management styles. **[6]**

i) Autocratic.

ii) Democratic.

iii) Laissez - faire.

Q2) a) Describe matrix structure of organization. Under which circumstances, this form of organization is used? **[5]**

b) Describe roles and responsibilities of a project manager. **[5]**

Q3) a) What is Repetitive project management? Explain by giving suitable example. **[5]**

b) Write a detailed note on Mass Haul Diagram with the help of neat diagram. **[5]**

Q4) a) Give step by step procedure of crashing of network. **[6]**

b) Explain resource leveling and its applications in construction. **[4]**

P.T.O.

Q5) a) How is the MIS used effectively on construction site? **[5]**

b) Design a training programme for site engineers on tunnel site. **[5]**

Q6) Write detailed note on any two of the following : **[10]**

a) Standard time.

b) Activity sampling.

c) Time lapse photography technique.

Q7) a) Give various provisions in Workman's compensation act. **[6]**

b) Give the factors included in indirect cost of accidents. **[4]**

Q8) a) Describe "Management By Objectives" with suitable examples. **[6]**

b) What are the advantages of incentive schemes? **[4]**

Total No. of Questions :8]

SEAT No. :

P4006

[Total No. of Pages : 3

[5255]-503

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

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat 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/ information wherever necessary.***

Q1) a) Explain in detail various problems faced during tunneling operation in soft soil. Also suggest suitable measures to overcome these problems. **[5]**

b) Discuss about the drilling patterns used for Drill and Blast method of tunneling in hard rock strata.

Discuss the importance of ventilation in tunnel construction process. **[5]**

Q2) For a high rise building construction (40 storeys) concreting operations were planned using RMC setup with transit mixers and concrete pumps. For this particulars project. **[10]**

a) List out various factors on which the concrete pump output will depend.

b) Draw a typical site layout for this project clearly showing the location of transit mixer delivery point, concrete pump and the building.

c) What will be the specifications of the concrete that has to be pumped?

d) List out various hazards involved and precautionary measures to be adopted to prevent the accidents.

Q3) a) With the help of neat labeled sketches explain the well point method of dewatering system to be used for construction of basement car park with a parking capacity of 200 cars . Assume suitable data. **[5]**

P.T.O.

b) List out various methods of dewatering. Explain in detail the electro-osmosis method of dewatering with suitable sketches. Recommend a suitable method of the following cases:

i) Metro rail tunnel construction in Black cotton soil.

ii) pedestrian subway puncturing an aquifer in basalt. **[5]**

Q4) Write short notes on (any four): **[10]**

a) Tremie method of concreting.

b) Roller Compacted Concrete.

c) Asphalt grouting.

d) Part face Tunnel Boring Machine.

e) Specifications of Concrete to be used for under water concreting operations.

Q5) a) Discuss the sequence of construction of pneumatic caisson in construction of a bridge pier over a perennial river. Draw a neat labeled sketch showing the site layout arrangement also. **[5]**

b) What do you mean by tilts in well foundations? What are the causes of tilts? Recommend suitable preventive and corrective measures to avoid such tilts in well foundations. **[5]**

Q6) Following defects were observed in case of pile concreting for a bored cast in situ type of pile. **[10]**

a) Discontinuity of concrete in the pile shaft at various levels.

b) Collapse of the reinforcement cage in the pile shaft.

c) Soil and rock pieces at the base of the pile shaft

d) Disintegration of concrete in the pile shaft.

e) Poor pile performance under load test.

Enlist the reasons for occurrence of each type of defect. Suggest suitable precautionary measures you would undertake to prevent such defects.

Q7) In a construction of Metro Railway Project, part of alignment of the metro passes under a flyover for a length of 750m. As a Project Manager you have to suggest a suitable technique for construction out of the following options:

a) Use of Steel Sheet Piles

b) Use of R.C. Diaphragm walls.

c) Use of 750 mm dia. bored cast in situ touching piles.

Justify the reasons for recommending a particular method and clearly state the merits of the selected method over other methods. Also enlist the drawbacks of other methods. **[10]**

Q8) Write short notes on (any four): **[10]**

a) Anchor Piles.

b) Open Caissons.

c) Mound type of Coffer dam.

d) Colgrout technique.

e) Shotcreting.

Total No. of Questions :8]

SEAT No. :

P4007

[Total No. of Pages : 2

[5255]-504

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

RESEARCH METHODOLOGY TREATMENT

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) With suitable example explain Applied Research. **[5]**

b) Explain why selecting an appropriate research problem is the key to successful research. **[5]**

Q2) a) Explain the technique involved in defining a research problem. **[5]**

b) Explain different types of research design. **[5]**

Q3) a) What are the characteristics of a Good Research Question for a Literature Review. **[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 questionnaires. **[5]**

b) What is cluster analysis? Explain the difference between hierarchical clustering and non-hierarchical clustering. **[5]**

Q5) a) Differentiate between 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) Explain the steps involved in writing report. **[5]**

Q7) a) Write down the good characteristics of good Abstract. **[5]**

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

Q8) Write a research proposal for a suitable research problem (any problem related to Civil engineering can be considered) to a funding agency with reference to the following terms: Title, Introduction, origin of the problem, expected outcome, literature review, Significance of the study in the context of current status, objectives, methodology, year wise plan. **[10]**

Total No. of Questions :8]

SEAT No. :

P4008

[Total No. of Pages :2

[5255] - 505

M.E. (Civil) (Construction Management)

CONSTRUCTION CONTRACTS ADMINISTRATION AND MANAGEMENT

(2013 Pattern) (Semester - II) (End Semester)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) What is meant by Pre qualification system? Explain how it is useful in bidding process. Give suitable examples. **[5]**

b) What are the different stakeholders involved in large construction project? Explain how the contracts differ with each of them. **[5]**

Q2) a) "The greatest opportunity to Prevent Claims comes to an end once tender-documents are finalized and the contract is awarded." Comment on this statement with examples. **[6]**

b) What is EOI (Expression of Interest)? How and when it is used in construction? **[4]**

Q3) Write a detailed note on Dispute Resolution Board w.r.t following points. **[10]**

a) Objective.

b) Functioning of the DRB.

c) Advantages of DRB.

d) Points of differences from Arbitration.

P.T.O.

Q4) a) Describe in brief the key characteristics of ICE conditions of contract. **[4]**

b) Differentiate between general conditions of contract and special conditions of contract. **[6]**

Q5) a) Define following terms as per Indian Contract Act. **[6]**

i) Valid Contract.

ii) Voidable contract.

iii) Void Contract.

b) Give any two valid excuses for non performance of contract. **[4]**

Q6) a) Define the extent of application for Indian Arbitration act. **[4]**

b) Give a detailed note on powers of arbitrators. **[6]**

Q7) a) What is the procedure of appeal against awards given by conciliation? **[6]**

b) Under what grounds the arbitral awards can be set aside? **[4]**

Q8) a) What are the applications of Bailment Act? Explain by giving suitable example. **[4]**

b) Explain following terms w.r.t injunctions. **[6]**

i) Temporary.

ii) Perpetual.

iii) Mandatory.

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Total No. of Questions : 8]

SEAT No. :

P4009

[Total No. of Pages : 3

[5255] - 506

M.E. (Civil - Construction Mangement)

PROJECT ECONOMICS & FINANCIAL MANAGEMENT

(2013 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q.5 or Q. 6 and Q. 7 or Q. 8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figure to the right indicates full marks.***
4) ***Assume suitable data, if necessary and clearly state:***
5) ***Use of cell phone is prohibited in the examination hall.***
6) ***Use of electronic pocket calculator is allowed.***

Q1) a) Describe how there is an economic change in 'Affordable Housing' by the introduction of Real Estate Regulatory Act (RERA). **[4]**

b) Explain the role of 'Lender's Engineer' in developer loan approvals. **[5]**

OR

Q2) a) Justify, "The implementation of GST will streamline the economy of Indian real estate sector". **[4]**

b) Explain how you will adopt cost control strategies at design stage for zero energy buildings. **[5]**

Q3) a) What is the Master Budget and what are the steps involved in the preparation of the master budget? **[4]**

b) Define corporate tax planning, discuss its importance and enlist the objectives & types of tax planning. **[5]**

OR

Q4) a) Define loan capital and discuss how working capital loans can help construction contractors. **[5]**

b) What is Direct Tax? Enlist Direct Taxes in India. **[4]**

P.T.O.

Q5) a) Explain in brief the accounting procedure regarding contract accounts. **[6]**

b) From the following information, prepare the Balance Sheet of ABC Ltd. Showing the details of working: **[10]**

Paid up capital	Rs. 50,000 .
Plant and Machinery	Rs. 1,25,000
Total Sales (p.a.)	Rs. 5,00,000
Gross Profit	25%
Annual Credit Sales	80% of net sales
Current Ratio	2
Inventory Turnover	4
Fixed Assets Turnover	2
Sales Returns	20% of sales
Average collection period	73 days
Bank Credit to trade credit	2
Cash to Inventory	1 : 15
Total debt to current Liabilities	3

OR

Q6) a) The details of Shreenath Company are as under: **[10]**

Sales (40% cash sales)		15,00,000
Less: Cost of sales Gross Profit:		7,50,000
		7,50,000
Less: Office Exp. (incl. int. on debentures)	1,25,000	
Selling Exp.	1,25,000	2,50,000
Profit before Taxes:		5,00,000
Less: Taxes		2,50,000
Net Profit:		2,50,000

Balance Sheet

Particular	Rs.	Particular	Rs.
Equity share capital	20,00,000	Fixed Assets	55,00,000
10% Preference share capital	20,00,000	Stock	1,75,000
Reserves	11,00,000	Debtors	3,50,000
10% Debentures	10,00,000	Bills receivable	50,000
Creditors	1,00,000	Cash	2,25,000
Bank-overdraft	1,50,000	Fictitious Assets	1,00,000
Bills payable	45,000		
Outstanding expenses	5,000		
	64,00,000		64,00,000

the opening stock was of Rs. 3,25,000. Taking 360 days of the year, calculate the following ratios; also discuss the position of the company:

1) Gross profit ratio.
2) Stock turnover ratio.
3) Operating ratio.
4) Current ratio.
5) Liquid ratio.
6) Debtors ratio.
7) Creditors ratio

b) Write a short note on 'Completed-contract method'. **[6]**

Q7) Draft a detailed project report for development of BRT project in Pune city, under 'Public Private Partnership' (PPP) model. **[16]**

OR

Q8) Draft a detailed report for rising of funds for metro rail project in Pune city through central and state governments as well as local bodies with their respective share. **[16]**

Total No. of Questions : 8]

SEAT No. :

P4010

[Total No. of Pages : 3

[5255]-507

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

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) A cement manufacturer prepares two types of cements A and B. Based on the availability of raw materials, the manufacturer can produce 20000 bags of A and 40000 bags of B. The manufacturing equipment can fill up 45000 bags at a time. It takes 3 hours to fill up 1000 bags of A and 1 hour to fill up1000 bags of B. Total time available for the entire operation is 66 hours. Profit expected for A is Rs. 8/bag, and B is Rs. 7/bag. Formulate the LPP. **[5]**

b) Explain the canonical and standard form of LPP with suitable examples.**[5]**

Q2) For the given transportation problem, determine the initial basic feasible solution using **[10]**

a) North west corner rule method

b) Least cost method

	1	2	3	4	Supply
1	2	3	1	7	6
2	1	0	6	1	1
3	5	8	15	9	10
Demand	7	5	3	2	

P.T.O.

Q3) Four earth movers are to be assigned to four operators. The cost of operation of each machine is given below. Determine the appropriate allocation of the earth mover so as to minimize the operation cost. **[10]**

Operator	Earth mover			
	1	2	3	4
A	5	7	11	6
B	8	5	9	1
C	4	7	10	7
D	10	4	8	3

Q4) a) Write a note on Lagrange Multiplier Technique. **[5]**

b) Minimize the following function $f(x) = x^2 — 2.6x + 2$ in the interval (-2, 3) with 10% accuracy. Adopt Fibonacci method. **[5]**

Q5) A project manager is coordinating of three major construction sites. The manager has 9 units of equipment resources to be assigned in these projects. The time duration saved from each of the projects is tabulated as under. Determine the optimum allocation of the equipments to different sites so as to maximize the speed of operations. **[10]**

Equipment units	0	1	2	3	4	5	6	7	8	9
Project 1	30	45	60	70	79	90	98	105	100	90
Project 2	35	45	52	64	72	82	93	98	100	100
Project 3	42	54	60	70	82	95	102	110	110	110

Q6) a) State and explain the Kendall's notation in Queuing theory. **[6]**

b) State the applications of Queuing Models. **[4]**

Q7) a) A block making operator has to perform two major operations, molding and compaction. In total six different types of blocks are to be prepared. The details of the operation are given below. Determine the sequence in order to minimize the total production time. **[6]**

Block type	1	2	3	4	5	6
Molding time (mins)	3	12	5	2	9	11
Compaction time (mins)	8	10	9	6	3	1

b) Discuss the procedure to solve sequencing through more than two machines. Assume suitable data. **[4]**

Q8) a) Using Newton's method minimize the following, **[6]**

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

$$x_0 = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$$

b) Explain the following terms; **[4]**

Optimal solution, non-degenerate basic feasible solution, basic feasible solution and canonical form.

Total No. of Questions : 8]

SEAT No. :

P4011

[Total No. of Pages : 2

[5255]-508

M.E. (Civil) (Construction Management)

ENVIRONMENT AND ENERGY FOR SUSTAINABLE CONSTRUCTION

(2013 Course) (Semester - III)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any 5 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary***

Q1) a) Explain in detail the 3 E's of Sustainable development-Environmental, Economics, Ethics & Ecology. **[5]**

b) Explain in detail EIA procedure for a thermal power plant to be located in coastal area. **[5]**

Q2) a) Explain in detail the energy conservation act 2000. **[5]**

b) With suitable examples explain in detail the role of information technology in adopting sustainable construction practices. **[5]**

Q3) a) Explain in detail the concept of carbon funds, carbon credits. How they are beneficial to developing countries like India. **[5]**

b) With suitable examples explain the concept of sustainable building construction practices. **[5]**

Q4) a) Explain with suitable example the role of electrical, mechanical & plumbing consultants in green building. **[5]**

b) With suitable examples explain in detail the concept of sustainable building construction practices. **[5]**

Q5) a) With suitable examples explain the role of information technology in adopting sustainable construction practices. **[5]**

b) Explain in detail the role of recovery — water recovery, energy recovery etc. in building sector. **[5]**

P.T.O.

Q6) a) Enlist different international and national organizations related to environment protection. Discuss various policy decisions and measures undertaken by such organizations towards environment sustainability. **[5]**

b) Explain in detail the concept of energy management in a building. **[5]**

Q7) a) Explain in details the method to reduce carbon foot print of a cement manufacturing industry. **[5]**

b) Enlist any 04 eco friendly materials. Explain any 01 in detail with suitable examples. **[5]**

Q8) a) Explain in detail importance of socio-economic surveys for generating a development plan for an area. **[5]**

b) Explain government's role in strengthening and alleviating people's standard of living in under developed area. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4012

[Total No. of Pages : 2

[5255]-509

M.E. (Civil) (Construction and Management)
TQM IN CONSTRUCTION
(2013 Course) (Semester-III) (End Semester)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions out of eight.***
2) ***Figures to the right indicate full marks.***
3) ***Make suitable assumptions if required.***
4) ***Take suitable data as required.***
5) ***Use of scientific calculator is allowed.***

Q1) a) Name any three Quality Gurus and explain their interpretation of Quality with the help of examples from a building Project. **[5]**

b) Explain the concept of internal and external customer for a construction firm with examples. **[5]**

Q2) a) Distinguish between QC and QA with examples. **[5]**

b) Differentiate between a process based approach and conventional approach with examples. **[5]**

Q3) Explain 8 principles of ISO 9001 with examples from construction sector. **[10]**

Q4) Following defects are observed in a newly constructed flat: **[10]**

a) Water is not draining properly from Bathroom.

b) Flooring tiles in the living room is not aligned properly.

Explain how you would determine the cost of poor quality for each of the above defects.

P.T.O.

Q5) Explain with examples: **[10]**

a) QFD

b) Quality Circle and its importance

Q6) Explain in brief various contents of a quality manual. Draft a quality manual for a contractor's organization. **[3+7]**

Q7) Prepare a detailed checklist for R.C.C. work. **[10]**

Q8) Explain the term "6 Sigma". Differentiate between "DMAIC" and "DMADV" Methodology. Explain the criteria for Black Belt of Six Sigma. **[10]**

Total No. of Questions : 8]

SEAT No. :

P4013

[Total No. of Pages : 2

[5255]-510

M.E. (Civil - Structures)

ADVANCED MECHANICS OF SOLIDS

(2013 Pattern) (Credit Course)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Obtain Strain compatibility Equation for 2D problem in Elasticity. **[5]**

b) Explain concept of stress at a point and stress on inclined plane. **[5]**

Q2) a) Define Airys stress function. Prove that stress function ϕ satisfying the governing equation $\nabla^4\phi = 0$, when body force is absent. **[6]**

b) State and explain generalised Hooks law. Express the stress strain relation for an elastic and isotropic body in terms of engineering constant E and υ. **[4]**

Q3) a) Derive differential equation of equilibrium of plane elasticity problem in polar co-ordinate with usual notation. **[7]**

b) What is axisymmetric problem. Show that for such a problem, the stress function ϕ =A logr + B r^2logr + Cr^2 + D. **[3]**

Q4) a) Derive an expression for radial (σ_r) and tangential (σ_t) stresses for thick cylinder of internal radious (r_i) and external radious (r_o) subjected to internal pressure (p_i) **[6]**

b) Derive component of stress due to circular hole in a stressed plate (Michell's problem). **[4]**

P.T.O.

Q5) A quarter circle beam of radius 1 m curved in plan is fixed at A and free at B. It carries vertical downward load P = 25 kN at free end B. Determine maximum bending moment, torsional moment and deflection. Also draw shear force, bending moment and torsional moment diagram. **[10]**

Q6) a) Show that the neutral axis of curve beam in elevation is below the centroidal axis towards the center of curvature. **[6]**

b) Differentiate between beam curve in plan and elevation. **[4]**

Q7) Assuming $\phi = m(x^2 / a^2 + y^2 / b^2 - 1)$ as a stress function for a bar of elliptical cross section subjected to pure torque Mt about its longitudinal axis, find moment and shear stress components. **[10]**

Q8) a) Derive differential equation for a beam resting on elastic foundation. **[4]**

b) An infinitely long steel beam of unit width and 250 mm thick is resting on elastic foundation whose modulus of foundation is 10 N/mm^2. A concentrated load of 12 kN is applied at a point. Determine maximum deflection and maximum bending stress assuming E = 200 GPa. **[6]**

Total No. of Questions : 8]

SEAT No. :

P4014

[Total No. of Pages : 2

[5255] - 511

M.E. (Civil Structures)

STRUCTURAL DYNAMICS

(2013 Course) (Semester - I) (End Semester)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) Consider a system of two dampers, with damping constants and arranged in parallel as shown in Fig. 1. The rigid bar to which the two dampers are connected remains horizontal when the force F is zero. Determine the equivalent damping constant of the system. **[10]**

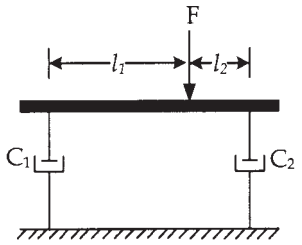


Fig. 1

Q2) Derive the response for a damped SDOF system subjected to an harmonic excitation. **[10]**

Q3) A damped spring-mass system with values of c = 100 kg/s, m = 100 kg, and k = 910 N/m, is subject to a force of 10 cos (3t)N. The system is also subject to initial conditions : x_0 = 1 mm and v_0 = 20 mm/s. Compute the total response, x(t), of the system. **[10]**

Q4) Explain linear acceleration and constant acceleration methods. **[10]**

P.T.O.

Q5) Write the dynamic equation in matrix form for the system shown in Fig.2 and calculate its Eigen values and Eigen vectors. Take m_1 = 1 kg, m_2 = 4 kg, $k_1 = k_3$ = 10 N/m and k_2 = 2 N/m. **[10]**

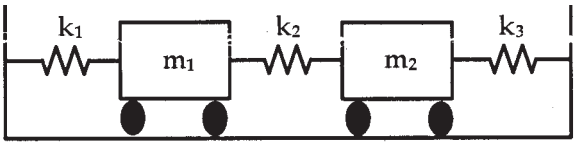


Fig. 2

Q6) Explain step-by-step procedure of Stodola method. **[10]**

Q7) Explain Wilson method. **[10]**

Q8) Determine the response for free longitudinal vibration for a prismatic beam fixed at one end and free at the other. **[10]**

Total No. of Questions :8]

SEAT No. :

P4015

[Total No. of Pages : 3

[5255]-512

M.E. (Civil - Structures Engg.)

ADVANCED DESIGN OF STEEL STRUCTURES

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Sketch various schematic arrangements used for hoarding. **[3]**

b) The hoarding structure is to be installed on the top of the building (2.5 m height). The hoarding carries display board 12m × 5m. Suggest the suitable hoarding structure to carry this board. Calculate all the loads acting on the hoarding structure. Draw FBD of the suggested structures, showing calculated forces on it. **[7]**

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

b) Design a castellated beam in grade Fe410 steel to carry an imposed load of 6 kN/m and dead load of 5 kN/m over a simply supported span of 20m. Assume that the compression flange is fully restrained. **[7]**

Q3) a) What is mean by microwave tower, explain with examples. **[3]**

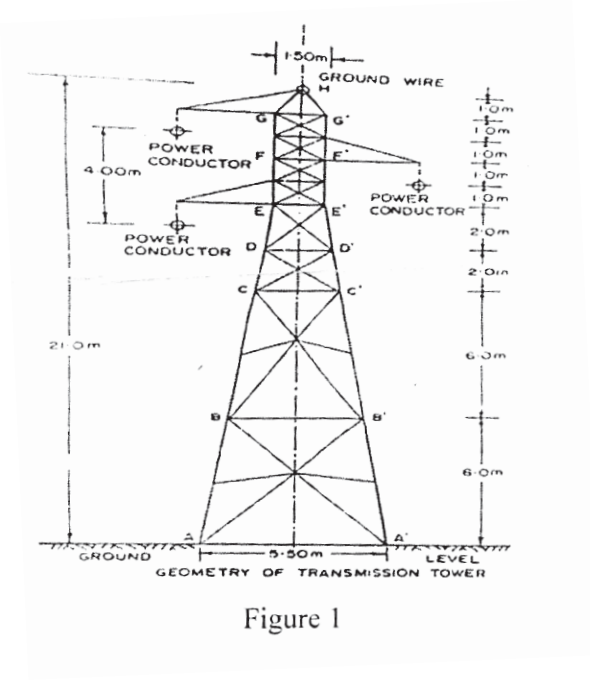
b) Determine the various forces (lateral forces due to wind, longitudinal forces, if any, torsional forces, if any and dead load) acting on the tower under the following conditions:

i) Normal operating conditions.

ii) Top-most power conductor in broken condition.

iii) Ground wire in broken condition. Refer figure-1 **[7]**

P.T.O.



GEOMETRY OF TRANSMISSION TOWER

Figure 1

Q4) a) Draw figures and explain typical free standing towers. **[3]**

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 3m. The width of the tower at the top is 3.5m. Select a suitable configuration for the tower and determines maximum compressive fore and tension in the tower legs and also the maximum shear at the base, for the following data.

Weight of antenna disc and fixtures : 9kN

Weight of platform at the top : 0.82 kN/m^2

Weight of railing at top : 0.30 kN/m^2

Weight of ladder and the cage : 0.65 kN/m

Weight of miscellaneous item : 2.5 kN **[7]**

Q5) a) What are tubular structures? Write down its various purpose and its important advantages. **[3]**

b) Find the column section properties and allowable load for the column section shown in figure 2. The effective length of column is 3.2 m. Take fy =235 MPa. **[7]**

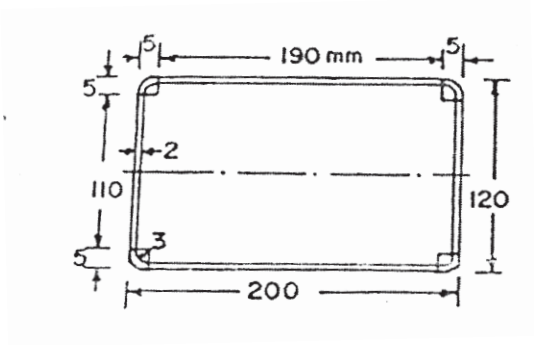


Figure 2

Q6) a) What are the advantages and disadvantages of light gauge sections and draw different forms of it. **[3]**

b) Design a member of a tubular truss. A tension member of a truss, carrying tensile forces of 22 kN, meets the principal rafter, carrying a compressive force of 110kN, at right angle. The panel length along the principal rafter is 2.5 m. design both the members, using IS : 1161 grade, Yst 240 tubes. Also, design the welded joint for the members, Taking the allowable stress in fillet weld as 110N/mm^2. **[7]**

Q7) a) State the difference between bolted and welded connections. **[3]**

b) A column section ISHB250@ 907.4 N/m is subjected to following factored loads. Axial compressive load, P=500kN

Moment, M = 45 kN.m

Assuming M25 grade of concrete for the pedestal and a square base plate, design the thickness of base plate. **[7]**

Q8) a) What are the types of chimneys? State the factor influencing the design of chimney. **[3]**

b) Find thickness of the supporting lined chimney to the following particulars.

Height of the chimney = 72 m.

Diameter of the chimney = 3.0 m

Thickness of the lining = 100 mm.

Wind Pressure = 1300 N/mm^2 on flat vertical surface.

Take safe tensile stess = 120 N/mm^2.

The foundation has to rest on medium soil having bearing capacity = 200 kN/m^2. **[7]**

Total No. of Questions :8]

SEAT No. :

P4016

[Total No. of Pages : 2

[5255]-513

M.E. (Civil - Structural Engineering)

RESEARCH METHODOLOGY TREATMENT

(2013 Pattern) (Semester - I) (501404)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Explain the points to be considered while developing a research problem and hypothesis. **[5]**

b) Explain the Research process in a flowchart. **[5]**

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

b) Discuss the three tests of sound measurement: Test of validity, reliability and practicality. **[5]**

Q3) a) Explain in detail the secondary sources of data and explain its limitations. **[5]**

b) What is Hypothesis? Explain Type I and type II errors. **[5]**

Q4) a) "Interpretation is a fundamental component of Research process". Explain. **[5]**

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

Q5) a) Mention the methods of Factor Analysis. Explain in detail any one. **[5]**

b) Write a note on advantage and limitation of Regression Analysis. **[5]**

Q6) a) Explain in detail Multicollinearity. **[5]**

b) Enlist different hypothesis testing methods. Explain any two. **[5]**

P.T.O.

Q7) a) "Research report writing is and art and science as well". Give your opinion on this statement considering the important components of report writing. **[5]**

b) State the importance of references in scientific research. **[5]**

Q8) Write a research proposal for a suitable research problem (any problem related to civil engineering can be considered) to a funding agency with reference to the following terms: Title, Introduction, origin of the problem, expected outcome, literature review, Significance of the study in the context of current status, objectives, methodology, year wise plan. **[10]**

Total No. of Questions :8]

SEAT No. :

P4017

[Total No. of Pages :2

[5255] - 514

M.E. (Civil - Structural Engineering)

FINITE ELEMENT ANALYSIS

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) For the following boundary value problem solve using point collocation method $\frac{d^2u}{dx^2} - u = x \quad 0 \le x \le 1$. The conditions given are $u(0) = 0$ and $u(1) = 0$. Choose $x = 0.25$ and 0.5 as the collocation points. Consider the approximate solution in form of $a_1 (x - x^2) + a_2(x^2 - x^3)$. **[6]**

b) Derive elemental stiffness matrix for a plane truss element or 1 - D bar element using variational approach. **[4]**

Q2) a) From the fundamentals derive the shape functions of CST element in area coordinates and hence obtain strain - displacement matrix for the element. **[5]**

b) Explain the use of Pascal's triangle in formulation of displacement function in Finite element method. Explain with suitable examples, compatible and completeness requirements of displacement functions. **[5]**

Q3) Analyse the plane truss shown in the Fig. 1 using direct method of finite element method. Take AB=1000 mm, BC=1000 mm and height of truss =1000 mm. D point is at center of CB and subjected to horizontal load of 200 kN. Young's Modulus is 200 GPa **[10]**

P.T.O.

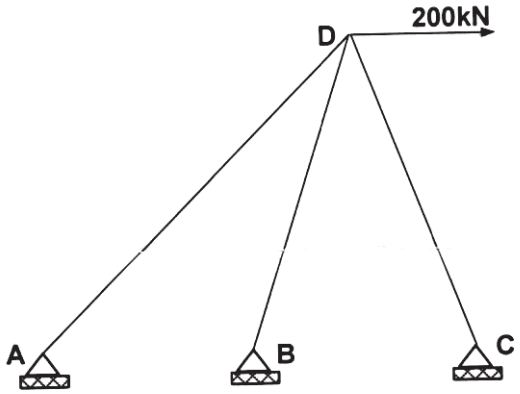


Fig. 1

Q4) a) What are serendipity elements? Derive the shape function for eight noded serendipity element in Cartesian or natural coordinate system. **[6]**

b) For a tetrahedral element derive the shape function in terms of the volume of tetrahedral and express the displacements in terms of shape function. **[4]**

Q5) a) Write the expressions for normal and shear strain for the axisymmetric element and give the isotropic stress/strain relationship for the axisymmetric element. **[3]**

b) Derive the stiffness matrix for a typical triangular axisymmetric element starting from fundamentals. **[7]**

Q6) Explain the term Jacobian matrix. Formulate strain displacement matrix for a two dimensional isoparametric element in plane elasticity problem, using Jacobian matrix. **[10]**

Q7) Write a short note on any one type of plate bending elements. Explain conformity of the displacement function of the element. **[10]**

Q8) a) Which elements are called as shell elements? Write short note on Flat shell element. **[5]**

b) Write a note on Ahmad's degenerated solid element. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4018

[Total No. of Pages : 2

[5255] - 515
M.E. (Civil) (Structure Engg.)
THEORY OF PLATES AND SHELLS
(2013 Credit Course) (Semester - II)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) Differentiate between thin plate theories for small and large deflections. **[4]**

b) For isotropic plates, under the action of lateral loading determine the stress-strain relations and hence the moment curvature relations in Cartesian coordinate system. **[6]**

Q2) a) Derive an expression of flexural rigidity for thin plate. **[2]**

b) A rectangular plate of size a x b with four edges simply supported carries a concentrated load at any point on the plate. Derive the expression for the deflection of the plate. **[8]**

Q3) a) Describe the stepwise procedure in the Levy's method for thin plate bending analysis. Apply these steps to obtain the maximum deflection in a square plate subjected to uniformly distributed load of intensity q per unit area. **[8]**

b) Explain in brief Reissener-Mindlin Theory **[2]**

Q4) a) A simply supported circular plate of radius a carries uniform loading of intensity q. Find the maximum values of deflection and expression for radial moment. **[8]**

b) State the boundary condition for the analysis of circular plate. **[2]**

P.T.O.

Q5) a) Explain in detail the classification of thin shells and explain the assumptions made in the theory of thin elastic shell. **[4]**

b) Derive the equations of equilibrium of shell of revolutions with axisymmetric loading. **[6]**

Q6) a) Explain membrane theory and derive equilibrium equation for circular cylindrical shell. **[6]**

b) State and explain boundary conditions for circular cylindrical shells. **[4]**

Q7) A horizontal cylindrical shell closed at both ends is filled with water and is simply supported at ends. Derive the stress resultants along any meridian in the shell. **[10]**

Q8) Explain the beam method of analysis of cylindrical shells. Discuss the advantages and limitations of the Lundgren's beam theory for cylindrical shells. **[10]**

Total No. of Questions : 8]

SEAT No. :

P4019

[Total No. of Pages : 2

[5255]-516

M.E. (Civil - Structure Engg.)

ADVANCED DESIGN OF CONCRETE STRUCTURES

(2013 Pattern) (Semester - II) (501409)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

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

i) Rectangular slab with all four edges fixed

ii) Rectangular slab with two adjacent edges fixed and two edges free

b) Explain guidelines for establishing axes of rotations and yield lines. **[4]**

Q2) A rectangular slab 5.5m×5.5m is simply supported at the ends. Design the slab to carry superimposed load of 4.75kN/m^2, if the slab is to be orthogonally reinforced. Use M20 and Fe 500. Use yield line theory. **[10]**

Q3) Design a circumferential and radial reinforcement in the base slab of elevated water tank for 1.15 lakh liters with diameter of water tank 14m using M25, Fe 500. Circumferential load on periphery is 1800kN, SBC is 220kN/m^2. **[10]**

Q4) Design an interior panel of flat slab 5m×6m for a live load of 4.25kN/m^2 and FF 1.25kN/m^2. Use M20 and Fe 415. **[10]**

Q5) Design a grid slab for a floor of hall 10m×14m having square grid of 1.75m. Use M25 and Fe 500. **[10]**

P.T.O.

Q6) Design a square bunker to store 155 tonnes of cement for the following. Density of cement is 31.5kN/m^2. Angle of repose is 30º. Use M20 Fe 500. Draw details of reinforcement. **[10]**

Q7) Design raft foundation for the following **[10]**

Center to center distance of column in both directions is 2.75m, column size 350×350mm, working axial load on each column is 800kN. The depth of the strata is 2.2m. Use M25 and Fe 500. SBC 140kN/m^2. Draw reinforcement details.

Q8) Design a bell type RCC shear wall for a length of 3.6m and thickness 230mm. Axial forces are 1750kN and 275kN due to dead and live load and seismic load respectively. Use M25 and Fe500. Draw reinforcement details. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P4020

[Total No. of Pages : 3

[5255]-517

M.E. (Civil-Structure Engg.)

EARTHQUAKE ENGINEERING AND DISASTER MANAGEMENT

(2013 Credit Course) (Semester - III)

Time : 3 Hours] *[Max. Marks : 50*

Instruction to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q. 7 or Q. 8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figure to the right indicates full marks.***
4) ***Assume suitable data, if necessary and clearly state.***
5) ***Use of cell phone is prohibited in the examination hall.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***IS 456, IS 1893, IS 13920 are allowed in the examination***

Q1) a) What are the different phases involved in disaster management? Explain each in brief? **[4]**

b) What do you mean by pre disaster and post disaster activities? Explain each with suitable example? **[5]**

OR

Q2) a) What are different types of Disaster? What are the different stages of disaster management? Explain each stage in brief? **[5]**

b) Why and how the modern disaster manager is involved in pre disaster and post disaster activities? **[4]**

Q3) a) Design the reinforcement for a column of size 450mm X 450mm subjected to DL = l000kN, LL = 800kN and EL= 550kN along with Moment due to DL, LL, EL as 50kN.m, 40 kN.m and 100 kN.m respectively. The column has an unsupported length of 3.0 m and is braced against side sway in both directions. Use M25 grade concrete and Fe415 steel. **[5]**

b) What are the causes of instability of steel buildings? Discuss in detail the P-δ effect? **[4]**

OR

P.T.O.

Q4) a) Determine lateral forces at different storey levels for a plan of fourstorey school building as shown in Figure 4.1. Assume D.L. = 5kN/m^2, L.L. = 4kN/m^2 on each floor and 1.5 kN/m^2 on roof. Assume floor height 4m for ground and 3m for remaining storey with soil type hard and seismic zone III. **[5]**

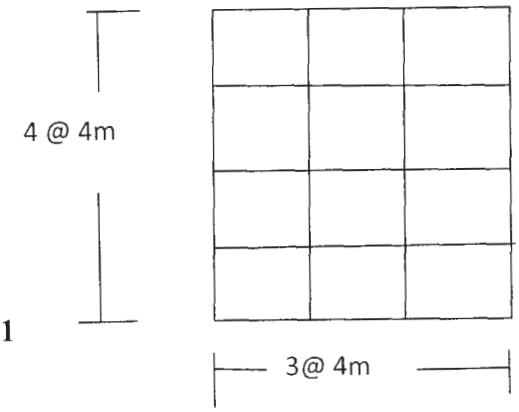

Figure 4.1

b) Discuss the advantages and disadvantages of different types of steel frames that can be provided in a steel building in an earthquake prone region. **[4]**

Q5) a) Discuss the effect bomb blast loading and strong ground motion on structures. Compare their action and remedies? **[8]**

b) 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. **[8]**

OR

Q6) a) Define : (Any four) **[8]**

i) Blast Wind

ii) Clearance Time

iii) Drag Force

iv) Ground Zero

v) 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? **[8]**

Q7) a) Write a note on any two **[8]**

i) Fire loads and fire resistance Level

ii) Period of Structural Adequacy (PSA)

iii) Methods of fire protection

b) 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.**[8]**

OR

Q8) a) Explain various techniques for local retrofitting of RC buildings? Give reasons for poor performance of masonry buildings? **[8]**

b) Explain any three retrofitting techniques used for masonry buildings?**[8]**

x x x

Total No. of Questions : 8]

SEAT No. :

P4021

[Total No. of Pages : 3

[5255]-518

M.E. (Civil) (Structures)

DESIGN OF RCC & PRESTRESSED CEMENT CONCRETE BRIDGES

(2013 Course) (Semester-III) (601014)

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 and 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) Explain Economic Span of Bridge and how it is calculated. **[5]**

b) Classify the bridges according to material of construction. **[5]**

Q2) a) Explain importance of Impact load analysis on road bridges. **[5]**

b) Explain IRC Class AA and Class B standards of loadings. **[5]**

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

Clear span of the culvert = 5.0 m

Clear carriage way width = 7.5 m

Size of kerb = 200 mm × 400 mm

Average thickness of wearing coat 80 mm

Use material M 20, Fe 500

Loading class AA

Draw the cross section showing details of reinforcement at mid-span and at junction of the slab are kerb.

P.T.O.

Q4) Design the deck slab only and calculate the maximum bending moment and shear force intermediate post tensioned pretressed concrete bridge girder for the following. Effective span = 21 m, width of carriageway = 7.5 m. No. of beams 3, equally spaced along the carriage way width, Spacing of cross girders = 3 m c/c, width of footpath on either side of carriageway = 1 m loading class = IRC class AA, kerb size = 200×600 mm, Material M25 & TMT for deck slab. **[10]**

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

b) Explain factors affecting design of rigid frame bridges. **[5]**

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

Maximum Vertical load = 1500 kN

Minimum Vertical load = 500 kN

Dynamic Vertical load = 60 kN

Transverse lateral load = 50kN

Longitudinal load = 60 kN

Longitudinal total translation = 10 mm

Rotation at support = 0.002°

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 the selection criteria for wing wall. **[5]**

b) Explain with sketches various types of wing walls. **[5]**

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

Diameter of pier at bottom = 2.0 m

Height of bearing above the maximum scour level = 16 m

Permissible horizontal displacement at bearing level = 10 mm

Total vertical load including self-weight of pier = 6500 kN

Total lateral force at scour level = 150 kN

Submerged unit weight of soil = 10 kN/m^3

Material of pier and footing = M 30 & Fe 500

Velocity of water current = 3 m/s consider cross current ratio

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

Total No. of Questions : 8]

SEAT No. :

P4022

[Total No. of Pages : 2

[5255]-519

M.E. (Civil) (Hydraulic Engg.)
FLUID MECHANICS
(2013 Course) (Semester-I) (501041)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Derive the continuity equation for one-dimensional flow, stating the assumption made in deriving the equation. **[4]**

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

Q2) a) Derive Euler's equation of motion for one - dimensional flow. **[5]**

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

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

b) Write the Navier Stokes equations. Explain meaning of each term. **[4]**

Q4) a) What are analytic functions? Examine whether following functions are analytic or not $W = Z^2 - a Z$, $W = \log Z^2 + a$. **[4]**

b) An oil with 850 kg/m^3 and dynamic viscosity 0.18 N-s/m^2 flows through a 12 cm diameter horizontal pipe. The pressure drop over a 2 m length of pipe is 20 kPa. Determine the average velocity, the flow rate and the wall shear stress. **[6]**

P.T.O.

Q5) a) Write a short note on development of boundary layer over a flat plate. **[4]**

b) Derive Karman integral momentum equation. **[6]**

Q6) a) For the following velocity profile in the boundary layer, calculate displacement and momentum thickness: $\frac{u}{U} = 2n - n^2$ where $n = \frac{y}{\delta}$ **[6]**

b) Write a short note on formation and control of boundary layer separation. **[4]**

Q7) a) Write a short note characteristics of laminar flow. **[4]**

b) Derive equation for density ratio for Normal shock wave. **[6]**

Q8) a) Derive equation for shear stress for turbulent flow between two fixed parallel plates kept at a distance h apart. **[6]**

b) Derive energy equation for compressible flow with adiabatic conditions. **[4]**

Total No. of Questions :8]

SEAT No. :

P4023

[Total No. of Pages : 2

[5255] - 520

M.E. (Civil) (Hydraulics Engineering)

IRRIGATION AND DRAINAGE ENGINEERING

(2013 Course) (Semester-I) (501042)

Time : 3Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) Discuss flow of water in saturated and unsaturated soil. **[5]**

b) Calculate the depth and frequency of irrigation required for a crop pattern having the following data. **[5]**

i) Root zone depth =0.9 m

ii) Field Capacity =16%

iii) Wilting point = 10%

iv) Specific Weight of Soil = 1.50 gm/cc

v) Consumptive use = 20mm per day

vi) Irrigation Efficiency = 50%

Assume 50% depletion of available moisture before application of irrigation water at field capacity.

Q2) What are the causes and effects of soil erosion? How to prevent soil erosion? **[10]**

Q3) Why pressurised irrigation system is preferred than flooding? Compare drip irrigation and sprinkler irrigation system considering following points. **[10]**

i) General concept.

ii) Advantages and disadvantages.

iii) Elements.

P.T.O.

Q4) When lift irrigation system is preferred? Explain lift irrigation considering following points: **[10]**

a) Design consideration involved in intake well, jack well, rising main.

b) Distribution system.

Q5) What are the situations in which one recommend sprinkler irrigation system? Discuss its advantage and limitations. Describe sprinkler system considering the components of the system. **[10]**

Q6) What do you mean by warabandi? What data is necessary to plan and design the system? How and where this system is actually carried out in Maharashtra? **[10]**

Q7) explain the regulation of flow by various canal outlets.. **[10]**

Q8) Write short notes on: **[10]**

a) water logging

b) Role Ministry of agriculture in effective drainage system**.**

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Total No. of Questions : 8]

SEAT No. :

P4367

[Total No. of Pages : 3

[5255]-521

M.E. (Civil-Hydraulics)

PLANNING AND MANAGEMENT OF WATER RESOURCES

(2013 Pattern) (Semester - I)

Time :3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Explain water supply management with reference to - i) community water use, ii) agricultural water use, iii) industrial water use. **[5]**

b) Determine the optimal diameter of a pumping main for the following data:

Design period = 30 yrs; discharge = 4 ML/D at present, increasing to 8 ML/D at 30 yr; length of the pumping main = 5,000 m; static lift = 30 m; Hazen William coefficient of the pipe = 120 at present, reducing to 100 at 30 yr; hours of pumping in a day = 16 hr; combined efficiency = 60 %; energy charges = Rs 3/kWh; and interest rate = 8 %. Assume minor losses as 10 % of the frictional head loss.

Available pipe sizes and their unit cost shown in parentheses are: 200 mm (1,092 Rs/m); 250 mm (1,432 Rs/m); 300 mm (1,813 Rs/m); 350 mm (2,260 Rs/m); 400 mm (2,730 Rs/m); 450 mm (3,267 Rs/m); 500 mm (3,810 Rs/m); 600 mm (5,016 Rs/m); and 700 mm (6,553 Rs/m).

[5]

Q2) a) Explain - excess water management. **[5]**

P.T.O.

b) Which of the following plan is more economical at 6.5 % interest rate? **[5]**

	Plan A	***Plan B***
Cost of equipment (Rs.)	51,000	36,000
Annual O & M cost	2,200	2,600
Salvage value	7,000	6,000
Service life	30 years	15 years

Compare the two alternate plans by i) equivalent annual cost, and ii) present worth methods.

Q3) a) Explain - general approach for capacity estimation of an impounding reservoir. **[5]**

b) Write a short note on - transfer of water from surplus areas to deficit areas. **[5]**

Q4) a) Explain objectives and necessity of water resources planning and management. **[5]**

b) Explain the constraints for water resources development. **[5]**

Q5) a) Explain following discounting factors: i) Single payment factors, ii) Uniform Gradient- Series factors. **[5]**

b) Explain - construction and maintenance of artificial wells. **[5]**

Q6) a) Explain - Linear Programming (LP) approach for capacity estimation of an impounding reservoir. **[5]**

b) Explain cost benefit analysis of water resources project. **[5]**

Q7) a) Explain how to carry out planning for flood control. **[5]**

b) Explain in brief different methods of sediment yield determination. **[5]**

Q8) a) A farmer takes a loan of Rs. 50,000 from a bank to purchase a pump costing Rs. 50,000. The life of the pump is 10 years and the salvage value is zero. If the bank charges 10 % rate of interest :

i) Find equal yearly installments the farmer will have to pay to repay the loan in 10 years.

ii) Give the year wise statement of the installment contribution towards payment of interest and repayment of the loan.

Find all answers if the salvage value of the pump, at the end of its life of 10 years, is Rs. 10,000; and the bank agrees to receive this amount at the end of the loan repayment period and accordingly reduce the yearly installment. **[5]**

b) Write a short note on - Spatial and temporal characteristics of water resources. **[5]**

Total No. Of Questions :8]

P4024

SEAT No. :

[Total No. of Pages : 2

[5255] - 522

M.E. (Civil) (Hydraulics Engineering)

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I)

Time : 3Hours] *[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) a) What can be the possible sources of a research problem? Explain with an example. **[5]**

b) Explain the technique involved in defining a research problem. **[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 three tests of sound measurement: Test of validity, reliability and practicality. **[5]**

Q4) a) Explain Rating scale as a scaling technique with appropriate examples. **[5]**

b) Explain the sources which can and/or should be used for selecting a research problem. **[5]**

P.T.O.

Q5) a) What is a t-test? When is it used and for what purpose? Explain with an example. **[5]**

b) Write a note on 'Centroid method of factor analysis'. **[5]**

Q6) a) Explain the basic principle of ANOVA. **[5]**

b) List distribution free tests which are generally being used.Explain any one in detail. **[5]**

Q7) a) A research idea should be published in a journal. justify. **[5]**

b) List types of reports and explain the requirements of any one in detail. **[5]**

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

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

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Total No. of Questions :8]

SEAT No. :

P4025

[Total No. of Pages :2

[5255] - 523

M.E. (Civil) (Hydraulic Engg.)

OPEN CHANNEL HYDRAULICS

(2013 Pattern) (Semester - II) (501046)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) Define most efficient channel section and derive formula for most efficient triangular section. **[5]**

b) Derive equation for energy loss for hydraulic jump occurring on a horizontal floor. **[5]**

Q2) a) Discuss factors affecting Manning's roughness coefficient 'n'. **[5]**

b) Write a short note on control of hydraulic jumps using baffle blocks. **[5]**

Q3) a) Explain the characteristics of S1 and S2 profiles. **[4]**

b) Draw possible flow profiles for **[6]**

i) Milder slope - Steeper Mild - Milder Mild.

ii) Mild - Steeper - Steep.

Q4) a) Discuss the method of direct integration for solving gradually varied flow equation. **[4]**

b) A rectangular channel 6 m wide flow with normal depth of 1.5 m with a slope of bed 1 in 8100. The channel ends in an abrupt drop. Find how far upstream of this section will the depth be 1.4 m. Use direct step method and take only two steps. Take Manning's coefficient = 0.015. sketch and mention the profile **[6]**

P.T.O.

Q5) a) Write a short note on method of characteristics of flood routing. **[5]**

b) Derive dynamic equation of spatially varied flow with increasing discharge. **[5]**

Q6) a) Route the following flood through a reach for which K= 8 h and x = 0.25. At t = 0 the outflow discharge is 8 m^3/s. Use Muskingum method. **[6]**

Time (h)	0	4	8	12	16	20	24	28	32
Inflow (m3/s)	8	16	30	30	25	20	20	15	10

b) Draw the possible flow profiles for side weir. **[4]**

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

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

Q8) a) Derive equation for velocity of monoclonal rising wave having gradually varied unsteady flow. **[4]**

b) Write a short note on wave propagation with reference to velocity of wave, velocity of water and celerity. **[6]**

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Total No. Of Questions :8]

P4026

SEAT No. :

[Total No. of Pages : 2

[5255] - 524

M.E. (Civil) (Hydraulics Engineering)

SEDIMENT TRANSPORT & RIVER MECHANICS

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

Time : 3Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Solve any Five questions from Eight questions.***
2) ***All question 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) a) Discuss in brief Origin and formation of sediments. **[5]**

b) What are the Bulk properties of sediment. **[5]**

Q2) a) Illustrate bed forms like ripples and duneswith characteristics. **[5]**

b) What are the various approaches of establishment of incipient motion? **[5]**

Q3) a) Using meyer - peter and müller method, estimate the bed load transport of sediment in an alluvial channel, 150 m wide and 4m deep carrying a discharge of 280 m^3/s. The channel bed slope is 1 in 4000 and the mean size of the sediment is 0.3 mm. **[7]**

b) Briefly explain "Saltation Mechanism". **[3]**

Q4) a) Compare Kennedy method and Lacey method for the design of an irrigation channel giving in detail all the steps of the design. **[5]**

b) Explain the Tractive force approach method of channel design. **[5]**

P.T.O.

Q5) a) Explain **[5]**

i) Agradation

ii) Degradation

b) what is river gauging? Explain the methods of river gauging in detail. **[5]**

Q6) a) Write a Short note on "silting of reservoir". **[5]**

b) Explain in detail River training for flood control. **[5]**

Q7) a) What are the preventive & protective measures of sediment control. **[5]**

b) Discuss "River bank protection". **[5]**

Q8) a) Enlist the different river models & discuss any one of them**.** **[5]**

b) Explain Sediment transport through pipes, considering the following points. **[5]**

i) Heterogeneous suspension.

ii) Sliding bed Regime.

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Total No. of Questions : 8]

SEAT No. :

P4027

[Total No. of Pages : 2

[5255]-525

M.E. (Civil) (Hydraulics Engg.)

HYDROLOGY

(2013 Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to candidates:

1) ***Answer any 5 of the following questions.***
2) ***Neat diagram should be drawn wherever necessary.***
3) ***Figures to right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain the role of Hydrology in the water resources development and management of a country. **[4]**

b) What are the utility of constructing DAD curves and Maximized DAD curve? The isohyetal map over an area is given in the table. What is the average depth of precipitation in 24 hours that can be expected over an area of 2750 sq-km. **[6]**

Isohyet (mm)	25	24	23	22	21	20	19	18	17	16
Area enclosed km^2	550	1320	2050	2550	3000	3300	3580	3800	3900	4000

Q2) a) Explain **[5]**

i) Stochastic process

ii) Sample Path and

iii) State Space

b) The annual rainfall at a place is found to exceed 750mm with a probability of 0.4, and exceeds 800mm with a probability of 0.30. If the annual rainfall is assumed to be normal random variable, find the probability that it exceeds 90mm during any year. **[5]**

P.T.O.

Q3) a) Explain flow duration curves when no data is available. **[4]**

b) The flood frequency analysis for a river using Gumbel's method, gave following results. Estimate the flood magnitude for this river having a return period of 450 years. **[6]**

Sr. No.	Return period T (years)	Peak flood (m^3/s)
1	50	41.50
2	100	47.25

Q4) a) Explain the Gumbel's method of extreme value distribution. **[5]**

b) The mean and standard deviation at a station for a data of 50 years for a river gave 4750 m^3/s and 1150 m^3/s. Determine the flood discharge for a return period of 225 years, using Gumbel's method. Find a also the 95% and 80% confidence limit for the estimate. **[5]**

Q5) a) What is a design flood & its utility? Explain **[5]**

i) Spillway design flood.

ii) Standard Project flood.

iii) Probable maximum flood.

b) Explain Risk, Reliability and safety factor. **[5]**

Q6) a) What are aquifers & their types? **[4]**

b) Derive an expression for steady state discharge of a well fully penetrating into a confined aquifer. **[6]**

Q7) a) Explain the Cooper & Jacob method to determine the aquifer parameters. **[5]**

b) Determine the flow velocity of groundwater using Slichter and Hazen constant of 450 and 900, using the data as below. **[5]**

i) Viscosity coefficient of water at 10°C = 1

ii) Effective particle size of aquifer material = 0.1 mm

iii) Hydraulic gradient = 1 in 100

Q8) a) Explain the conditions aiding in saltwater intrusion in coastal aquifer & measures to control intrusions. **[5]**

b) What are the different types of water wells and explain wells with impervious lining. **[5]**

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Total No. of Questions : 7]

SEAT No. :

P4028

[Total No. of Pages : 2

[5255]-526

M.E. (Civil) (Hydraulics Engineering)
DAM ENGINEERING
(2013 Pattern) (Semester - III) (601052)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Figures to right indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) Explain seismie analysis of Gravity dam. **[6]**

b) Determine the base width of an elementry profile of a gravity dam to retain water upto a depth of 30m. Assume triangular uplift factor of 0.75. Take relative density of masonry as 2.25. **[4]**

Q2) a) Explain 'Lattice slab method' of design of gravity dam. **[4]**

b) Explain RCC dam and colgrout mansory dam. **[6]**

Q3) a) Obtain the best central angle for constant angle arch dam layout. **[5]**

b) Explain thin cylinder method of stability analysis of arch dam. **[5]**

Q4) a) Explain 'Tehri dam' as Rockfill dam from different perspectives. **[5]**

b) Explain different types Buttress dam with a sketches. **[5]**

Q5) a) Determine the FOS of d/s slope of an earthan dam(homogeneous section) drawn to a scale of 1:500, with the following data: **[6]**

i) Length of slip arc = 15 cm,

ii) Total area of 'N' rectangle = 16.5 cm^2

iii) Total area of 'T' rectangle = 7.00 cm^2

iv) Area of 'U' rectangle = 5 cm^2

v) Angle of internal friction = 26°

vi) Cohesion = 0.2 kg/cm^2

vii) Specific weight of soil = 1.8 g/cm^3

P.T.O.

b) Explain the neat sketch the function of following components **[4]**

i) Chimney drain

ii) Relief well

iii) Cut off

iv) Berm

Q6) a) Design an overflow section of gravity dam to pass a discharge of 2400 m^3/sec over a length of 120m. The river bed level is 400m and maximum water level is 450m. D/S face has a slope of 0.75H : 1V. U/S face is vertical. Design a ogee spillway. **[6]**

b) Explain different types of spillway gates with their suitability. **[4]**

Q7) a) State the instruments used in earthen dam during construction & after construction & state their functions. **[6]**

b) State how the following parameters are measured by dam instruments **[4]**

i) Uplift pressure

ii) External deformation.

iii) Pure water pressure

iv) Scepage

x x x

Total No. of Questions : 8]

SEAT No. :

P4029

[Total No. of Pages : 4

[5255]-527

M.E. (Civil - Hydraulics)

OPTIMIZATION TECHNIQUES

(2013 Pattern) (Semester - III) (End Semester)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Use Fibonacci method to maximize $Z = 10x^2 - 4x^3$ in the interval (0,2) with n = 5 upto 3 iterations. **[5]**

b) What is dynamic programming? How it is different from linear programming? Also state the Bellman's Principle of optimality. **[5]**

Q2) a) A farmer has a 100 acre farm. He can sell all the tomatoes, lettuce or radishes that he produces. The price he can obtain is Rs. 1 per kg for tomatoes, Rs. 0.75 a head for lettuce and Rs. 2 per kg for radishes. The average yield per acre is 2,000 kg of tomatoes, 3,000 head of lettuce and 1,000 kg of radishes. The fertilizer is available at Rs. 0.5 per kg and the required amount per acre is 100 kg each for tomatoes and lettuce and 50 kg for radishes. The labour required for sowing, cultivating and harvesting per acre is 5 man-days for tomatoes and radishes and 6 man-days for lettuce. A total of 400 man-days of labour are available at Rs. 20 per man-day. Determine the crop mix so as to maximize the farmer's total profit. **[5]**

b) Use Lagrange Multiplier Technique to maximize

$$Z = X_1^2 + 2X_2^2 + 3X_1X_2 + 2X_1 + 6X_2$$ **[5]**

Subject to $2X_2 - X_1 = 4$,

And $X_1, X_2 \geq 0$

P.T.O.

Q3) a) Find the minimum of the function $f = 2\lambda^5 - 4\lambda^3 - 20\lambda + 5$ using Golden section method in the interval (0,5). **[4]**

b) Solve the following problem using the Big M-method: **[6]**

Maximize $Z = 6x_1 - 3x_2 + 2x_3$,

Subject to $2x_1 + x_2 + x_3 \leq 16$,

$3x_1 + 2x_2 + x_3 \leq 18$,

$x_2 - 2x_3 \geq 8$,

$x_1, x_2, x_3 \geq 0$

Q4) a) Use the graphical method to solve the problem: **[4]**

Maximize $Z = 10x_1 + 20x_2$,

Subject to $-x_1 + 2x_2 \leq 15$

$x_1 + x_2 \leq 12$

$5x_1 + 3x_2 \leq 45$

and $x_1, x_2 \geq 0$

b) 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- **[6]**

Allocation	Returns from			
	User 1	User 2	User 3	User 4
0	0	–2	–3	1
10	4	5	4	2
20	5	4	5	3
30	7	5	6	6
40	3	4	4	8
50	4	9	3	9
60	3	7	0	10

Q5) a) Consider market share of e-wallet companies, company A-30%, Company B-35%, Company-35%, respectively. Their Transition probability matrix will be **[6]**

$$P = \begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0.7 & 0.1 & 0.2 \\ 0.3 & 0.3 & 0.4 \\ 0.2 & 0.3 & 0.5 \end{bmatrix} \end{array}$$

Determine the market share of e-wallet companies after one and two year.

b) Explain Decision making without experimentation. **[4]**

Q6) a) Find the value of the Game **[5]**

	B_1	B_2	B_3
A_1	9	8	–7
A_2	3	–6	4
A_3	6	7	7

b) Explain Morkov's process with suitable example. **[5]**

Q7) a) Workers came to a tool store room to enquire about special tools for particular job. The time between the arrivals is 60 seconds and the arrivals are assumed to be in Poisson distribution. The average time is 40 seconds.

Determine: **[6]**

i) Average queue length

ii) Average length of non-empty queue

iii) The waiting time of arrivals

iv) The probability of no arrival in the system

b) Write a short note on Monte Carlo simulation. **[4]**

Q8) a) The rainfall distribution in monsoon season is as follows **[6]**

Rain in cm	0	1	2	3	4	5
Frequency	50	25	15	5	3	2

Simulate the rainfall for 10 days using the following random numbers:

67, 63, 39, 55, 29, 78, 70, 06, 78, 76 and then find average rainfall.

b) Explain graphical solution procedure for solution of Game. **[4]**

Total No. of Questions : 8]

SEAT No. :

P4030

[Total No. of Pages : 2

[5255]-528

M.E. (Civil) (Geotechnical Engineering)

ADVANCE SOIL MECHANICS

(2013 Course) (Semester-I) (501121) (End Sem.) (Theory)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) Explain the total stress field on any three-dimensional element by giving suitable matrix form and with suitable sketches; Also, explain independent shearing stresses and normal stresses acting on element. **[10]**

Q2) Explain the concept of contact pressure; Draw the contact pressure distribution diagrams for (a) Cohesive soil & (b) Cohessionless soil. What is effect of non-uniform pressure distribution of contact pressure on the design of footings. **[10]**

Q3) Explain the effective stress principle proposed by Terzhaghi for location of a failure plane. How the location of failure plane can be directly derived from mohr's circle. **[10]**

Q4) Explain the active and passive states of limiting equilibrium in a soil mass. Derive the equations for active and passive earth pressure using Mohr's circle in c-ϕ soils. **[10]**

Q5) Explain the lateral earth pressure in (a) open cuts and (b) Braced cuts with suitable sketches. **[10]**

P.T.O.

Q6) Derive an equation to calculate the seepage through anisotropic soil using the transformed field and actual field flow nets. **[10]**

Q7) Explain how numerical analysis of seepage in layered soil is carried out with suitable sketches. Assume suitable data, if necessary. **[10]**

Q8) Explain the construction of flow nets below weirs, resting on non-homogeneous soils. **[10]**

Total No. of Questions :8]

SEAT No. :

P4031

[Total No. of Pages :1

[5255] - 529
M.E. (Civil) (Geotechnical Engg.)
GROUND IMPROVEMENT TECHNIQUES
(2013 Course) (501122)

Time : 3Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt any 5 questions.***
2) ***Draw neat figures, wherever necessary.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data, if necessary, clearly stating it.***

Q1) a) Describe the lay minerals with their structures. **[5]**

b) Write short note on cation exchange. **[5]**

Q2) Describe the principle in chemical stabilisation and behaviour of chemically stabilized soils. **[10]**

Q3) a) Write in detail about factors influencing cement stabilisation. **[5]**

b) Discuss mixture design for time stabilisation. **[5]**

Q4) How is stabilisation of soil carried out using ash and slab? Describe in detail. **[10]**

Q5) Discuss both thermal and electro kinetic stabilization. **[10]**

Q6) Which are the vibration techniques for deep compaction? Discuss any two of them. **[10]**

Q7) Describe stabilisation of soft soils using lime columns. **[10]**

Q8) Explain compaction and jet grouting in detail. **[10]**

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Total No. of Questions :8]

SEAT No. :

P4032

[Total No. of Pages : 2

[5255]-530

M.E. (Civil) (Geotechnical Engineering)

ROCK MECHANICS

(2013 Pattern) (Semester - I)

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) Discuss the role of rock engineer in surface excavations of open pit mines. **[4]**

b) Discuss the classification of rocks for various engineering purposes. **[6]**

Q2) a) Explain the rock anchoring in detail. **[4]**

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

Q3) a) Explain with neat sketch about the Flat jack method for determination of stresses in rock. **[4]**

b) Write a note on hydraulic fracturing method of estimate the stress in rock. **[6]**

Q4) a) Explain the Mohr Coulomb failure criteria for rocks. **[4]**

b) With help of neat sketch explain the following test on rock **[6]**

i) Triaxial Test

ii) Splitting tension test

Q5) a) What are the various factors affecting the rupture behavior of rock. **[4]**

b) Explain the phenomenon of fracturing rock masses in compression. **[6]**

P.T.O.

Q6) a) Write a note on structural discontinuities in rock masses. **[4]**

b) Discuss the rock parameters required for analysis of underground structures. **[6]**

Q7) a) Write a note on foundation anchoring. **[4]**

b) Enlist various modes of failure of footings on rock. Explain any one in detail . **[6]**

Q8) a) Write a note on kinematic analysis of rock slopes. **[4]**

b) Explain the rock slopes with reference to modes of failure and factors affecting. **[6]**

Total No. of Questions : 8]

SEAT No. :

P4033

[Total No. of Pages :2

[5255] - 531

M.E. (Civil) (Geotech.)

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) Describe the process of formulation of research hypotheses.

b) What is a research design? Explain the objectives of research.

Q2) a) Explain various steps involved in preparing research proposal.

b) Describe in brief the four operations of data processing.

Q3) a) Elaborate the strategies for better literature review.

b) Enlist the various data collection methods and discuss the factors affecting their choice.

Q4) a) Describe the various types of measurements with suitable example.

b) Describe in brief various operations in data processing.

Q5) a) Differentiate between qualitative and quantitative data analysis with suitable examples.

b) Describe the 'analysis of variance' test and its significance.

P.T.O.

Q6) a) What is multiple regression analysis? When is it used?

b) Explain the concept of factor analysis.

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

b) Write a note on plagiarism.

Q8) a) What is regression analysis? When is it used?

b) What are the elements of research paper? What is the significance of Impact Factor of a journal?

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Total No. of Questions :8]

SEAT No. :

P4034

[Total No. of Pages :3

[5255] - 532

M.E. (Civil) (Geotechnical Engineering)

ADVANCE FOUNDATION ENGINEERING

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) Explain the method of undisturbed sampling in cohesive soils. Draw the neat sketch of piston sampler. **[4]**

b) Two thin - walled sample tubes from the supplier's catalog has the dimensions as follows: **[6]**

Outside Diameter (mm)	Inside Diameter (mm)	Length in (mm)
76.0	73.0	605
89.0	86.0	610

What is the area ratio, inside clearance, outside clearance of the samplers?

What kind of sample disturbance might you expect using either tube size?

Q2) a) Explain the seismic refraction method with reference to following: **[4]**

i) Objective.

ii) Test Procedure.

iii) Interpretation of result.

iv) Limitations.

P.T.O.

b) Determine the undrained shear strength of a cohesive soil layer for following data: **[6]**

i) The cone penetration test was conducted in soil layer at the dept where the total overburden pressure is 150 kN/ m^2.

ii) Observed penetration resistance is 45.5 kg/cm^2.

iii) Take cone factor N_k =20.

Q3) a) Explain the modes of shear failure of soil. Draw the neat labeled sketch. **[4]**

b) A square footing of size l.2m × l.2m is proposed to be constructed in sandy soil having γ =17.5 kN/m^3, C = 0 and ϕ' = 28°. The footing depth is 1.0m and the load on footing is eccentric. Assuming the one - way load eccentricity e = 0.2m calculate the ultimate load, Q_{ult}. **[6]**

Q4) a) Write a detailed note rigid beam design method for raft foundation. **[4]**

b) Determine the allowable bearing capacity of a raft foundation for following data : **[6]**

i) Raft size 10m × 10m is to be constructed over sand deposit.

ii) The depth of foundation is 2m and allowable settlement is 25mm.

iii) Take corrected average penetration number is 10.9.

Q5) a) What are the various methods for providing anchors for a sheet pile wall? Explain with appropriate sketches. **[4]**

b) Write a note on free earth support method. **[6]**

Q6) a) Discuss the use of p - y curves pertaining to laterally loaded piles. **[4]**

b) A square pile 300mm × 300mm is embedded in sandy soil. The length of pile is 18m and the soil properties are γ =18 kN/m^3, ϕ' = 30°. Determine the Ultimate point load carried by the pile. Take N_q =*55.0* **[6]**

Q7) a) Enlist the types of cofferdam .Explain anyone in detail. **[4]**

b) Discuss the stability condition of a cellular cofferdam under the partial submergence condition. **[6]**

Q8) a) What are the design considerations for components of well foundation? **[4]**

b) Write a note on sinking of well. **[6]**

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Total No. of Questions :8]

SEAT No. :

P4035

[Total No. of Pages : 1

[5255] - 533

M.E. (Civil) (Geotechnical Engg.)

CONSTRUCTION METHODS IN GEOTECHNICAL ENGINEEING

(2013 Course) (Semester-II) (501127)

Time : 3Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt any 5 questions.***
2) ***Draw neat figures wherever necessary.***
3) ***Use of scientific calculator is allowed.***
4) ***Figures to the right indicate full marks.***

Q1) a) Describe the procedure for construction of raft foundation. **[5]**

b) Which are the dewatering techniques? explain. **[5]**

Q2) State the types of cofferdams discuss the bracing systems in each of them. **[10]**

Q3) Discuss the different methods of bottom seal construction. **[10]**

Q4) State all difficulties encountered during construction of cofferdam and explain any two. **[10]**

Q5) a) What are the site and foundation preparations required for caissons. **[5]**

b) Explain Launching of caissons. **[5]**

Q6) With neat sketch explain pneumatic caisson. **[10]**

Q7) Discuss the design considerations for rock excavation and also the planning stages. **[10]**

Q8) Explain two methods of tunnelling in soild rocks. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P4036

[Total No. of Pages : 2

[5255]-534

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

Time : 3 Hours] *[Max. Marks : 50*

Instructions:

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) *You are advised to attempt not more than five questions.*
6) *Your answers will be valued as a whole.*
7) *Assume suitable data, if necessary.*

Q1) Explain the procedure to evaluate short term and long term stability analysis for finite slopes using Swedish circle method. Also, state the assumptions mode. **[10]**

Q2) Explain how stability analysis of an earth dam in steady seepage state is carried out state the assumptions made in analysis. **[10]**

Q3) Draw a typical flow net for an earth dam with horizontal filter. Explain and derive an equation for determination of seepage discharge through the body of an earth dam, using typical flow net. **[10]**

Q4) What are the various factors taken into consideration, while deciding the preliminary section of an earth dam. **[10]**

Q5) Explain various types of pierometers used in an earth dam. Explain working principle of any one piezometer in detail. **[10]**

P.T.O.

Q6) What are the various typical components of rail embankments. Draw a typical layout of rail embankment and explain the functions of each component parts. **[10]**

Q7) Explain the Reinforced embankments on soft soils and reinforced steep slopes with suitable sketches. **[10]**

Q8) Write short notes on: **[10]**

a) Landslides - causes & remedial measures

b) Short creating & its field applications.

x x x

Total No. of Questions : 8]

SEAT No. :

P4037

[Total No. of Pages : 2

[5255]-535

M.E. (Civil) (Geotech Engineering)
GEOTECHNICAL EARTHQUAKE ENGINEERING
(2013 Pattern) (Semester - III) (601132)

Time : 3 Hours] *[Max. Marks : 50*

Instruction to the candidates:

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

Q1) a) Explain 'size of Earthquake'. **[5]**

b) Discuss 'PSHA'. **[5]**

Q2) a) Compare 'Continental drift & plate tectonics'. **[5]**

b) Discuss 'Wave Theories'. **[5]**

Q3) a) Explain 'Measurement of Dynamic Soil Properties'. **[5]**

b) Explain 'effect of local site condition'. **[5]**

Q4) a) Explain 'Seismic Reflection Test'. **[5]**

b) Discuss 'Ground Response Analysis'. **[5]**

Q5) a) Discuss 'causes & effects of liquefaction'. **[5]**

b) Explain 'green's function technique'. **[5]**

P.T.O.

Q6) a) Explain 'Seismic slope stability'. **[5]**

b) Explain 'goodman & Seed Approach'. **[5]**

Q7) a) Discuss different 'Soil Reinforcing techniques'. **[5]**

b) Explain EQ induced settlement. **[5]**

Q8) a) Discuss 'Seismic Design of Retaining wall'. **[5]**

b) How will you mitigate EQ effects? **[5]**

x x x

Total No. of Questions : 8]

SEAT No. :

P4038

[Total No. of Pages : 2

[5255]-536

M.E. (Civil) (Geotechnical Engineering)

GEOENVIRONMENTAL ENGINEERING

(2013 Credit Pattern) (Semester - III) (601133)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) What factors are considered for disposal of hazardous, non-hazardous and domestic wastes. Explain them in brief. **[5]**

b) Explain with neat sketch "single and double lined landfill". **[5]**

Q2) a) Write a short note on "Soil-waste interaction". **[5]**

b) Write a short note on "Reclamation of old waste dumps". **[5]**

Q3) a) Define de-watering. Also write the different methods used for de-watering. Explain them in brief. **[5]**

b) Determine the moisture content of a solid waste with the following composition. **[5]**

Sr. No.	Component	% by mass	Moisture contents in %
01	Food waste	35	70
02	Paper	20	06
03	Cardboard	05	05
04	Plastics	15	02
05	Garden waste	15	60
06	Others	10	15

P.T.O.

Q4) a) What is the need of solid waste management. Explain them in brief. **[5]**

b) Write brief note on: **[5]**

i) Ash ponds

ii) Tailing ponds

Q5) a) What are the different types of landfill? Explain them in brief. **[5]**

b) What is land filling? Write the planning and designing aspects which are considered for disposal of solid waste in land filling. **[5]**

Q6) a) What are the methods used for detection and control of sub-surface containment. **[5]**

b) Define incineration and write the different methods used. **[5]**

Q7) a) Write a short note on "Engineering properties and Geotechnical reuse of wastes". **[5]**

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

Q8) a) Define leachate. What is leachate movement? How it is controlled. **[5]**

b) What are the different sources of solid waste? **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4039

[Total No. of Pages : 2

[5255]-537

M.E. (Civil) (Environmental Engineering)

ENVIRONMENTAL LEGISLATION & MANAGEMENT SYSTEMS

(2013 Course) (Semester-I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) Discuss the Indian National Policies for Environmental Protection. **[10]**

Q2) Discuss important provisions under Water (P & Cp) Act. 1974 for legal Sampling and explain the procedure of legal sampling. **[10]**

Q3) Discuss important provisions under Air (P & Cp) Act. 1981 for violation of consent conditions and provisions for closures. **[10]**

Q4) Discuss the salient features of Environmental Protection Act. 1986 of Govt. of India. **[10]**

Q5) Discuss the principle and elements of ISO 14000 Series. **[10]**

Q6) Discuss the role of Judiciary in Environmental Protection. Also explain Public Interest Litigation. **[10]**

P.T.O.

Q7) Discuss the role of SPCB in implementation of various notifications issued by Govt. of India under EPA 1986. **[10]**

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

Total No. of Questions :8]

SEAT No. :

P4040

[Total No. of Pages :1

[5255] - 538

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

ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY

(2013 Pattern) (Semester - I)

Time : 3Hours] *[Max. Marks :50*

Instructions to the candidates:

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

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

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

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

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

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

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

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

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

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Total No. of Questions :8]

SEAT No. :

P4041

[Total No. of Pages : 2

[5255]-539

M.E. (Civil) (Environmental Engineering)

PHYSICO-CHEMICAL PROCESSES FOR WATER AND WASTE WATER TREATMENT

(2013 Pattern) (Semester - I) (501063)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Explain with suitable Sketch the Mass-Balance Principle; also discuss the configurations of ideal and non-ideal reactors. **[5]**

b) Enlist various types of reactors used in wastewater treatment. Explain reaction kinetics and reaction rates. **[5]**

Q2) a) What is flow rate? Give summary sheet of application of various flow rates in the design of waste water treatment. **[5]**

b) Explain the concept of zeta potential. **[5]**

Q3) a) A grit chamber has a wastewater depth of 0.9m. Calculate the time required by a particle to settle at the bottom. Also compute the length of the grit chamber if the flow through velocity is 0.3 m/s. **[5]**

b) Explain various zones of settling in water and wastewater treatment. **[5]**

Q4) Design a screen chamber to treat a maximum flow of 0.15 m^3/s of domestic wastewater. Use following data. **[10]**

a) Approach channel dimensions: 2.0 m × 0.6 m × 0.4 m.

b) Bar size 10 mm×50mm and opening = 25mm.

c) Velocity before the screen = 0.75 m/s.

Draw detail plan and cross-section showing nos of bars and detail dimensions.

P.T.O.

Q5) a) Discuss microbial growth pattern with neat sketch. **[6]**

b) Explain in detail: recycle and reuse of treated sewage for agricultural purpose. **[4]**

Q6) Design a Rapid sand gravity filter to treat a net flow of 150 m^3/hr. Use following additional data:

a) Quantity of backwash water used = 3%

b) Time lost in backwashing = 30 mins

c) Design rate of filtration = 5 $m^3/hr/m^2$.

d) L:W ratio 1:1.25

e) Size of perforations = 10mm.

Design :

i) Filter bed

ii) Sand depth

iii) Under drain system.

iv) Wash water troughs. **[10]**

Q7) a) What is adsorption? Discuss types of adsorption, also explain factors influencing an adsorption. **[5]**

b) Discuss Ion Exchange processes also mention various Exchange Materials. **[5]**

Q8) a) Explain the importance of chemical treatment processes with reference to oxidation and reduction reactions. **[5]**

b) What are the limitations of Biological treatment? Discuss in detail importance of aerobic treatment of wastewater. **[5]**

Total No. of Questions :8]

P4042

SEAT No. :

[Total No. of Pages : 2

[5255] - 540

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

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I)

Time : 3Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Solve any Five questions.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***

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

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

Q2) a) Explain the objectives of Literature Survey. **[5]**

b) What is Research. Justify its need. **[5]**

Q3) a) Enumerate the different methods of collecting data.Explain its merits and demerits. **[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. **[5]**

b) What is a hypothesis? Highlight the procedure of developing a good hypothesis. **[5]**

Q6) a) Write a note on Multivariate analysis. **[5]**

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

Q7) a) List different types of reports and discuss any one in detail. **[5]**

b) Explain the term "Plagiarism". **[5]**

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

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

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Total No. of Questions :8]

SEAT No. :

P4043

[Total No. of Pages :1

[5255] - 541

M.E. (Civil) (Environmental Engineering)

INDUSTRIAL WASTE WATER MANAGEMENT

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Each question carries equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Assume suitable data if necessary.***
6) ***Use of electronic pocket calculator and steam table is allowed.***

Q1) Give note on Waste Audit and Evaluation of pollution prevention options. **[10]**

Q2) Discuss in details about Flotation and Precipitation. **[10]**

Q3) Discuss with suitable example the Membrane Separation Process. **[10]**

Q4) Give note on methodology for safe Disposal of Treated Waste. **[10]**

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

Q6) Discuss & tabulate the characteristics of effluent from Mineral Processing industry. **[10]**

Q7) Discuss in details about Zero effluent discharge systems. **[10]**

Q8) Discuss in detail about Treatment for Dyestuff industry. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P4044

[Total No. of Pages : 2

[5255] - 542
M.E. (Civil Environmental Engineering)
AIR POLLUTION AND CONTROL
(Semester - II) (2013 Course) (501067)

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 figure wherever necessary.***
4) ***Assume necessary data.***
5) ***Use of scientific calculators is allowed.***

Q1) a) Explain global effects of air pollution. **[5]**

b) A sample is analysed at 0^oC and 1 atm. pressure is reported to contain 7 ppm of CO. Find the concentration in $\mu g/m^3$. L/mole at 0^oC and 1 atm. Pressure = 22.41. **[5]**

Q2) a) Explain the effect of SOX and CO_2 on human beings with specific concentration of gases. **[5]**

b) Find the effective stack height if a 50 m stack releases SPM at a rate of 1.25 gm/sec.The atmospheric pressure is 10.8 m of water. The temperature of ambient air and gases are is 27 ^oC and 400 °C. The stack diameter is 2.5 m. Stack gas velocity is 6 m/sec and wind velocity is 1.8 m/sec. **[5]**

Q3) a) Write Gaussian equations for estimation of pollutant concentration for different conditions. **[5]**

b) Design a gravity settler to remove all the iron particulates from a dust-laden gas stream with the data given as **[5]**

$dP = 35\ \mu m$, $Q = 4\ m^3/sec$, $\rho = 7.62\ g/cc$, inlet velocity = 3 m/s, $\mu = 1.81 \times 10^{-5}$ kg/m.sec.

P.T.O.

Q4) a) Calculate d/d_{pc} of a gas flow rate 8 m^3/sec, particle density 1500 kg/m^3, and diameter 10 μm, if multiple cyclone is used instead of single large unit (64 cyclone of each diameter 24 cm), $\mu = 1.81 \times 10^{-5}$ kg/m.sec, Ne = 5. **[5]**

b) Write the equation used to estimate plume rise. **[5]**

Q5) a) Write the composition of auto exhausts. **[5]**

b) Write the principle of wet scrub method to control gas pollutants and draw its schematic sketch and write its application. **[5]**

Q6) a) Write environmental guidelines for sitting industry. **[5]**

b) Write stack emission standard for any five industry. **[5]**

Q7) a) Write short note on vehicular emission and its effects. **[5]**

b) Define odour and explain the methods to control it. **[5]**

Q8) a) Write a short note on cigarette smoke. **[5]**

b) Explain indoor air pollution control through mechanical ventilation system. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4045

[Total No. of Pages : 1

[5255]-543

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

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Each question carries equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Assume suitable data, if necessary.***
6) ***Use of electronic pocket calculator and steam table is allowed.***

Q1) Tabulate and discuss the physical, chemical and biological properties of solid waste. **[10]**

Q2) What are the types of solid waste collection systems in detail? Give their advantages and disadvantages. **[10]**

Q3) Discuss how the Routing of vehicles and Sorting operations is done. **[10]**

Q4) Discuss about energy recovery from solid waste. Give its merit and demerits.**[10]**

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

Q6) How the different functional elements of solid waste management system plays important role in management. **[10]**

Q7) What are the Economical and financial aspects of solid waste management?**[10]**

Q8) Discuss the solidification and stabilization of hazardous wastes. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P4046

[Total No. of Pages : 1

[5255]-544

M.E. (Civil-Environmental Engineering)
ENVIRONMENTAL SANITATION
(2013 Course) (Semester - III) (601072)

Time : 3 Hours] *[Max. Marks : 50*

Instructions:

1) ***Answer any five questions.***
2) ***Each question carries equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Assume suitable data, if necessary.***
6) ***Use of electronic pocket calculator and steam table is allowed.***

Q1) Explain the communicable diseases and role of epidemiology in it. **[5 + 5 = 10]**

Q2) What are the Fly control methods? How prevention of fly breeding is carried out? **[5 + 5 = 10]**

Q3) What are the important factors that to be consider during study of industrial sanitation. Discuss each factor separately. (At least 4) **[10]**

Q4) Give note on systemic toxin and Neurotoxins and their effects. **[6 + 4 = 10]**

Q5) Give note low cost excreta disposal systems. **[10]**

Q6) Give note on rural sanitation improvement scheme. **[10]**

Q7) Give note on the following terms **[5 + 5 = 10]**

a) Domestic storage tank.
b) Flushing Tank.

Q8) Discuss the following: **[5 + 5 = 10]**

a) Flushing Cistern.
b) One-Pipe System.

x x x

Total No. of Questions : 8]

SEAT No. :

P4047

[Total No. of Pages : 1

[5255]-545

M.E. (Civil) (Environmental Engineering)

ENVIRONMENTAL IMPACT ASSESSMENT

(2013 Course) (Semester - III)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) Explain the term EIA. Discuss the various stages of EIA. **[10]**

Q2) Discuss the Environment Impact Assessment methodologies. **[10]**

Q3) Discuss the Impact prediction, Assessment and Mitigation measures for noise environment. **[10]**

Q4) Discuss the Impact prediction, Assessment and Mitigation measures for surface water and ground water. **[10]**

Q5) Discuss the Prediction and Assessment of Impact on cultural and socioeconomic environment. **[10]**

Q6) Discuss the procedure for conducting public hearing for obtaining Environmental Clearance. **[10]**

Q7) Discuss the general structure of EIA document. **[10]**

Q8) Discuss the procedure for obtaining Environmental Clearance for Industrial projects. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P4048

[Total No. of Pages : 2

[5255]-546

M.E. (Civil) (Water Resources and Environmental Engg.)
PLANNING AND MANAGEMENT OF WATER RESOURCES
(2013 Course) (501081) (Semester-I)

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 needs and opportunities planning and management of water resources. **[6]**

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

Q2) a) Comment on planning region and horizon in water resources. **[5]**

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

Q3) a) Explain various cost benefit study methods for single and multipurpose projects. **[6]**

b) Explain allocation of cost in multipurpose project. **[4]**

Q4) a) Explain in detail flood plain management. **[6]**

b) Discuss allocation of water priority wise while planning and managing water resources. **[4]**

P.T.O.

Q5) a) Explain methods to control reservoir sedimentation. **[4]**

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

Q6) a) Define resilience index and explain it through adaptive capacity and management aspect. **[5]**

b) Explain conceptual framework for vulnerability assessment. **[5]**

Q7) a) Enlist two methods to improve the Ground water content to develop the ground water resources in Maharashtra state. **[5]**

b) Explain how conjunctive use of surface and ground water play Important role in water management. **[5]**

Q8) a) What is 'Inter Basin Water Transfer', enumerate it with suitable example. **[4]**

b) Explain Basin planning. **[6]**

Total No. of Questions : 8]

SEAT No. :

P4049

[Total No. of Pages : 3

[5255] - 547

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

ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY

(2013 Course) (Semester - I) (501082)

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 calculator is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Use data sheet.***

Q1) Attempt the following (Any Five) : **[10]**

a) Various types of chemical reactions.

b) Various laws in mass transfer.

c) Air sampling technique in ambient air.

d) Automobile pollution.

e) Lapse Rate.

f) AAS.

Q2) Attempt any five : **[10]**

a) What is bio-kinetic coefficient?

b) What are the application of bio-kinetic constant?

c) Explain working of trickling filter.

d) Write the working of ASP.

e) Give Design steps of Septic tank.

f) What is Anoxic treatment?

P.T.O.

Q3) Attempt any two : **[10]**

a) Explain Growth of Rate Curve.

b) Various characteristics of Bacteria.

c) Write short note on Prokaryotic & Eukaryotic cell.

d) Differentiate between aerobic & anerobic metabolism.

Q4) a) Given the following data of operating ASP. **[8]**

i) Waste water flow Q = 35000 m^3/d.

ii) Inffluent total solids = 600 mg/d.

iii) Inffluent suspended solids = 120 mg/l.

iv) Inffluent BOD S_0 = 175 mg/l.

v) Effluent total solids = 495 mg/l.

vi) Effluent suspended solids = 22 mg/l.

vii) Effluent BOD S = 20 mg/l.

viii) MLVSS x = 2500 mg/l.

ix) Return sludge concentration x_r = 9800 mg/l.

x) Volume of aeration basin = 1000 m^3.

Determine :

1) Aeration period.

2) BOD load in Kg/m^3/d.

3) F/M Ratio.

4) Recirculation Ratio.

5) Total solid, suspended solids & BOD Removal efficiency.

b) Explain Waste generation Rate & Energy Recovery from SWM. **[2]**

Q5) Estimate size of aerobic digestion required to treat the sludge from PST designed to treat 80 MLD Waste Water check the volumetric & Estimate the % stabilization of atm. of gas produced per capita per day, for the waste water to be treated. It has been found that the quantity of dry solids & BOD ultimate removed is 0.2 kg/m^3 & 0.4 kg/m^3 resp. Assume that the sludge contain 99% moisture & has a specific quantity of 1.03. Other design assumptions are as follows : **[10]**

a) Sludge age = 10 days at 30ºC.

b) Efficiency of utilization = 0.6.

c) Y = 0.05.

d) Kd = 0.03 per day.

Q6) Explain how Environment is polluted by Natural contaminants & particulate matter. **[10]**

Q7) a) Design multi cyclone chamber for Flue gas of 12 m^3/sec. Assume all the necessary data. **[6]**

b) Explain working of absorption process in details. **[4]**

Q8) a) A Fabric filter must process 3.5 m^3/S of flue gas. Design the bag house filter with air to cloth ratio of 4.5 m^3/min/m^2. Determine no. of bags and physical arrangement. Take dia. of each bag as 210 mm. **[6]**

b) Explain radiation and types of radiation. **[4]**

Total No. of Questions :8]

SEAT No. :

P4050

[Total No. of Pages : 2

[5255]-548

M.E. (Civil) (Water Resources and Environment Engg.)
FLUID MACHANICS
(2013 Pattern) (Semester - I) (501083)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Define circulation, stream function, velocity potential. **[6]**

b) Define hydrodynamically rough and smooth boundaries. **[4]**

Q2) a) Derive Bernoulli's equation along streamline. **[4]**

b) The velocity distribution in the turbulent boundary layer over a flat plate is given as $\frac{u}{U_\infty}=\frac{3}{2}\frac{y}{\delta}-\frac{1}{2}\left(\frac{y}{\delta}\right)^3$. Obtain an expression for the displacement thickness, momentum thickness and energy 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 laminar flow between parallel plates with both plates fixed starting with Navier-Stokes equations. **[6]**

Q4) a) Given the complex potential, $W=\log_e Z^2$, evaluate the stream and velocity functions. Identify the flow pattern. **[4]**

b) Laminar flow takes place in a circular tube. At what distance from the boundary does the local velocity equal the average velocity. **[6]**

P.T.O.

Q5) a) Derive Karman Momentum Integral equation starting Navier Stokes equations. **[6]**

b) What are the characteristics of turbulent flow? **[4]**

Q6) a) What is boundary layer separation? What are its effects and methods to avoid separation? **[4]**

b) Derive Reynolds equation of motion. **[6]**

Q7) a) Find the stagnation temperature and pressure for carbon dioxide flowing at 150 m/s if the pressure and temperature in undisturbed flow are 500 kPa and 30ºC respectively. k = 1.28 and R = 188 J/kg K. **[5]**

b) Write in brief about Rayleigh and Fanno lines. **[5]**

Q8) a) Derive equation for stagnation density for a compressible fluid flow. **[6]**

b) Write a short note on compressible flow around submerged bodies. **[4]**

Total No. of Questions :8]

SEAT No. :

P4051

[Total No. of Pages : 2

[5255] - 549

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

RESEARCH METHODOLOGY TREATMENT

(2013 Pattern) (Semeter - I)

Time : 3Hours] *[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) a) Explain the errors in selecting a research problem. **[5]**

b) Explain the basic features of a research design. **[5]**

Q2) a) Enlist various Research funding agencies. Discuss about any one in detail. **[5]**

b) With suitable example explain Applied research. **[5]**

Q3) a) Under what circumstances would you recommend:-
i) Convenient Sampling
ii) Multistage Sampling
iii) Quota Sampling **[5]**

b) Discuss the sources of error in measurement. **[5]**

Q4) a) Discuss the graphic rating scale. **[5]**

b) Explain the sources which can and/or should be used for selecting a research problem. **[5]**

P.T.O.

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

b) Write a note on 'Centroid method of factor analysis'. **[5]**

Q6) a) Write a note on "Two way ANOVA". **[5]**

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

Q7) a) Discuss the steps involved in patenting a research idea. **[5]**

b) What would you cover in introduction of Research Report. **[5]**

Q8) Write a research proposal for a suitable research problem (any problem related to Civil engineering can be considered) to a funding agency with reference to the following terms:Title, Introduction, origin of the problem, expected outcome, literature review, Significance of the study in the context of current status, objectives, methodology, year Wise plan. **[10]**

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Total No. of Questions :8]

SEAT No. :

P4052

[Total No. of Pages :3

[5255] - 550

M.E. (Water Resources and Environmental Engineering)

ENVIRONMENTAL HYDRAULICS AND ENVIRONMENTAL STRUCTURES

(2013 Pattern) (Semester - II) [501086]

Time : 3 Hours] *[Max. 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) Write a short note on (Any Five) **[10]**

a) Pipe and connections.

b) Various types of valves.

c) LVDT.

d) Clavarino's Equation.

e) Birnie's Equation.

f) Diffusion.

Q2) a) Explain working of internal gear pump with figure. **[5]**

b) Determine the power of pump and optimum head if efficiency of pump is 85%. The pump is running at 800 rpm giving the following relationship.**[5]**

Q (Discharge) in m^3/min	Head in meter
0	24
4.6	21.2
6.2	20
14	18.1
18.2	14.2
23	0

The head of system is $Hm = 16 + 9.98 \times 10^{-3} Q^2$ in meter.

P.T.O.

Q3) a) The impeller of a centrifugal pump has 1.3m outside diameter. It is used to lift 1900 liters of water per second against a head of 12m. Its vanes make an angle of 45° with the direction of motion at outlet and runs at 430 rpm. If the radial velocity of flow at outlet is 04 m/s. Find the monometric efficiency. Also find the power required if the overall efficiency is 85%. **[5]**

b) Explain working of screw pump with figure. **[5]**

Q4) An air receiver consist of a cylindrical portion 3.5 meter length and 1.5 meter diameter. It is closed by hemispherical ends. The pressure is not exceed 3.5 Mpa. If the material is steel having yield point 300 Mpa and if factor of safety is 2.5 is used, calculate the required wall thickness of cylinder and thickness of hemispherical end. Assume joint efficiency as 0.92 for the shell and 0.8 for the end. Also determine storage capacity of the vessel. **[10]**

Q5) a) A three story RC fame building with each story having height of 4 meter. Total load on each Floor are 4100 kN on first floor, 3100 kN on second floor, 2600 kN on third floor and roof load is 2050 kN resp. The soil below foundation is assumed to hard rock. Find out the total base shear force as per Is code - 1983 - (Part - I) - 2002. **[6]**

b) A beam having cross section are of 110 millimeter square, length of 1.5 meter is attached by two spring at end one at top and other is at bottom find natural frequency of vibration of system. Take $E = 200 \times 10^3$ Mpa. **[4]**

Q6) A closed vessel is to be design to with stand internal pressure of 110 Mpa having inside diameter of 610 mm following properties assumed. Estimate thickness on basic of

a) Maximum principle stress theory.

b) Maximum shear stress theory.

Yield strength = 400 Mpa, Ultimate tensile strength = 500 Mpa, Poisson ratio 0.5 **[10]**

Q7) A pressure vessel consist of cylinder shell of inside diameter of 2.5 meter which is closed by torispherical head with a crown radius of 1150 mm. The operating pressure inside the cylinder is 2 Mpa. The yield strength is 400 Mpa. The corrosion allowance 3mm and weld efficiency 94%. Determine thickness of cylindrical shell and torishperical head. **[10]**

Q8) a) Determine depth of foundation required for square column carrying load of 600 kN vertical. The SBC of soil is 200 kN/m^2. Density of soil 30 kN/m^3, angle of repose is 20º. **[5]**

b) Determine thickness of wall for water tank by working stress method having capacity of 2000 cum. meter, if height of tank is 4.5 meter. Use M30 concrete and Fe 250 steel. **[5]**

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Total No. Of Questions :8]

SEAT No. :

[Total No. of Pages : 2

P4053

[5255] - 551

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

HYDROLOGY

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

Time : 3Hours] *[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 Stanford Watershed Model (SWM). **[6]**

b) Explain construction of Depth Area Duration Curves (DAD Curves). **[4]**

Q2) a) What is Pearson type I,II and III & their uses in hydrology. **[5]**

b) Write a note on Chi-square test. **[5]**

Q3) a) Explain the method of design flood estimation using the rational method. **[4]**

b) Explain the Goodrich method of flood routing **[6]**

Q4) a) Explain how the yield of an open Well can be determined using recuperation test. **[5]**

b) Define the terms: **[5]**

i) Aquifuge,

ii) Aquiclude,

iii) Aquitard

iv) Confined aquifer

v) Perched groundwater.

P.T.O.

Q5) a) Explain step by step design of tube well. **[5]**

b) What are the advatages of ground water compared to surface water**?[5]**

Q6) a) State Thiem's equation for study confined flow (No leakage). State assumptions made. **[6]**

b) What is ground water pollution? How the industrial use of water affects on it. **[4]**

Q7) a) Enlist the various methods of artificial recharge of ground water? and Explain any one in detail. **[5]**

b) What are different pumping equipment used to pump the ground water? Explain one in detail with neat diagram. **[5]**

Q8) a) Explain in detail electric analog model & analog model for ground water modeling. **[6]**

b) Explain digital computer models for ground water modeling. **[4]**

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Total No. of Questions : 8]

SEAT No. :

P4054

[Total No. of Pages : 2

[5255]-552

M.E. (Civil) (Water Resources & Environmental Engineering)
OPEN CHANNEL HYDRAULICS
(2013 Course) (Semester - II) (501088)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Derive for a trapezoidal channel section of most economical section **[4]**

i) half the top width = length of the sloping side

ii) hydraulic radius = ½ the depth of flow

b) State the characteristics of M_2 and S_2 profiles. Give examples of their occurrence. **[6]**

Q2) a) Explain behaviour of slope of water surface profile (dy/dx) at certain key depths. **[4]**

b) Starting from basic principles derive an expression for GVF for a wide rectangular channel in the form **[6]**

$$\frac{dy}{dx} = S_o \frac{1-\left(\frac{y_n}{y}\right)^{10/3}}{1-\left(\frac{y_c}{y}\right)^{3}}$$

Q3) a) Mention the types of jumps based on the basis of Froud number. **[2]**

b) At a certain section M in a rectangular channel of bed width 2 m, depth of flow is 1.2 m. When the rate of flow is 6 m^3/s estimate the distance from M to another section N where the depth is 1.4 m. The bed slope is 0.002 and Manning's n = 0.015. Take two steps. Sketch and classify the profile. **[8]**

P.T.O.

Q4) a) Derive equation for ratio of sequent depths for hydraulic jump on sloping floor. **[5]**

b) Explain the standard step method for GVF computation. **[5]**

Q5) a) Explain any three SVF profiles on bottom racks with sketches. **[6]**

b) Explain types of surges. **[4]**

Q6) a) Derive dynamic equation of spatially varied flow with decreasing discharge. **[4]**

b) Derive general equation for absolute velocity of uniformly progressing wave in rapidly varied unsteady flow. **[6]**

Q7) a) Explain bed forms. **[4]**

b) What is flood routing? Distinguish between reservoir routing and channel routing. **[6]**

Q8) a) Describe Kennedy's theory for the design of irrigation channel in alluvial soil. **[4]**

b) For the following flood hydrograph through a river reach for which K = 12 h and x = 0.20 find the discharge for first two time steps. At the start of the inflow flood the outflow discharge is 10 m^3/s. **[6]**

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

x x x

Total No. of Questions : 8]

SEAT No. :

P4055

[Total No. of Pages : 2

[5255]-553

M.E. (Civil) (Water Resource & Environmental Engineering)
ADVANCED WATER & WASTE WATER TREATMENT
(2013 Course) (Semester - III) (601092)

Time : 3 Hours] *[Max. Marks : 50*

Instructions:

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 the principle & working of reverse osmosis & U.F. for water & 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 theory of filtration? Explain in detail components, under drainage system, cleaning & operational trouble in RSGF. **[10]**

Q4) Design an aerated grit chamber for the treatment of municipal wastewater. The average flow rate is 0.5 m^3/s. Take peak factor as 2.75. **[10]**

Q5) Explain unit operation & unit operation. State the microorganisms in waste water discuss their importance in waste water treatment system. **[10]**

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) Explain the methods of sludge treatment & disposal with their advantages & disadvantages. **[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]**

x x x

Total No. of Questions : 8]

SEAT No. :

P4056

[Total No. of Pages : 2

[5255]-554
M.E. (Civil - WREE)
DAM ENGINEERING
(2013 Course) (Semester - III) (601093)

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 role of earthquake forces in the analysis and design of dams. **[4]**

b) Explain any one foundation treatments in gravity dams in detail. **[6]**

Q2) a) What are basic principles of dam design? Explain step by step procedure for design of earthen dam. **[7]**

b) Discuss causes of seepage in earthen dam. **[3]**

Q3) a) Explain any one theory for design of arch dam. **[7]**

b) State various forces acting on arch dam with neat sketch. **[3]**

Q4) a) Explain various types of rock fill dams and draw the sketch of one of them. **[6]**

b) What is buttress dam? Explain the classification of buttress dam. **[4]**

Q5) a) Explain straight drop spillway and ogee spillway. **[6]**

b) Explain side channel and siphon spillway. **[4]**

P.T.O.

Q6) a) Explain determination of settlement of earth dam embankments. **[6]**

b) Explain determination of settlement and lateral movements in dam. **[4]**

Q7) a) State common objectives of ICOLD and ICID. **[6]**

b) Explain functioning of global water partnership(GWP). **[4]**

Q8) a) How does global warming increased by large dams? **[6]**

b) What is the impact due to construction of dam on displacement and rehabilitation? **[4]**

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Total No. of Questions : 8]

SEAT No. :

P4057

[Total No. of Pages : 3

[5255]-555

M.E. (Mechanical) (Design Engg./CAD-CAM/AutomobileEngg.)
ADVANCED MATHEMATICS
(2013 Credit 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 non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Find an orthonormal basis for the space R^3, by applying Gram-Schmidt's method to the following vectors: (1, 2, 1), (1, 1, 1) and (3, -2, 1). **[5]**

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

Q2) a) Evaluate $\oint_C \frac{4-3z}{z(z-1)(z-2)}dz$, where C is the circle $|z| = 3/2$. **[5]**

b) Find the Laplace Transform of the periodic function $f(t) = \frac{kt}{T}$ for $0 < t < T$, and $f(t + T) = f(t)$. **[5]**

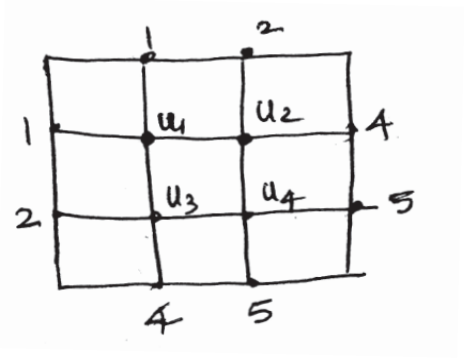
Q3) a) Solve the following differential equation in series $\frac{d^2y}{dx^2} - x\frac{dy}{dx} + x^2y = 0$. **[5]**

b) Find the solution of the initial value problem $\frac{d^2x}{dt^2} + \frac{dx}{dt} - 2x = 1 - 2t$ given $x = 0, \frac{dx}{dt} = 4$ at $t = 0$ using Laplace Transform. **[5]**

P.T.O.

Q4) a) Find the largest eigen value and the corresponding eigen vector by power method for $A=\begin{bmatrix}1 & 6 & 1\\ 1 & 2 & 0\\ 0 & 0 & 3\end{bmatrix}$ with $X_0=\begin{bmatrix}1\\0\\0\end{bmatrix}$. **[5]**

b) The steady state two dimensional heat flow in a plate is given by $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$. Find the values of the temperature at the interior points of the square grid given below. **[5]**



Q5) a) Given $\frac{\partial U}{\partial t}=\frac{\partial^2 U}{\partial x^2}$, $u(0,t)=u(4,t)=0$ and $u(x,0)=x/3\,(16-x^2)$. Obtain u if $h = 1$ using Schmidt-Bendre's method upto $t = 2$. **[5]**

b) Using Rayleigh-Ritz Method solve the boundary value problem $y''-y+4xe^x=0$, $y(0)=0=y(1)$. **[5]**

Q6) a) Solve the Euler equation for the following: **[5]**

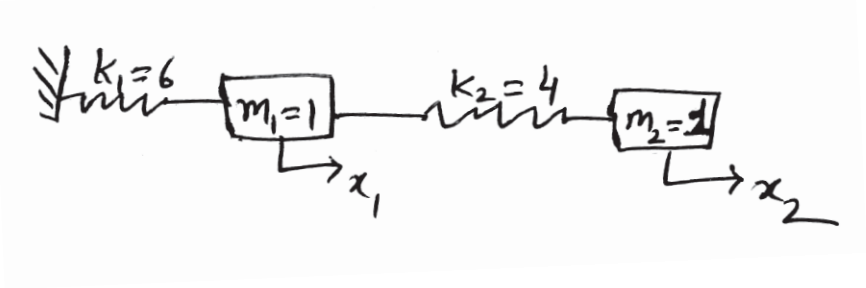
Functional $\int_{x_1}^{x_2}\left[y^2+(y')^2+2ye^x\right]dx$.

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; (2, -1), (5, -2) (-7, 3) & (8, 2).**[5]**

Q7) a) Under the transformation $w = \sin z$, prove that the straight line $x = c$ in the z-plane maps into conformal hyperbolas in w-plane and the straight line $y = b$ in z - plane maps into conformal ellipses. **[5]**

b) Find the fourier transform of $e^{-x^2/2}, -\infty < x < \infty$. **[5]**

Q8) a) The system of motion shown in the figure begins to vibrate. Assuming that there is no friction, determine the subsequent motion. **[5]**



b) Solve $\frac{\partial U}{\partial t} = \frac{\partial^2 U}{\partial x^2}, 0 \le x \le 1$; subject to the initial conditions $u(x,0) = \sin \pi x, \ 0 \le x \le 1$ and $U_t(x, 0) = 0$ with boundary conditions $u(0,t) = u(1,t) = 0, \ t \ge 0$ by taking $h = 0.2$ upto five levels. **[5]**

Total No. of Questions : 7]

SEAT No. :

P4058

[Total No. of Pages : 2

[5255] - 556

M.E. (Mechanical) (Design Engineering)

MATERIAL SCIENCE AND MECHANICAL BEHAVIOR OF MATERIALS

(2013 Course) (502202) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) A steel piece initially has a uniform carbon concentration of 0.25 wt% and is to be treated at 950ºC. If the concentration of carbon at the surface is suddenly brought to and maintained at 1.20 wt%, how long will it take to achieve a carbon content of 0.80 wt% at a position 0.5 mm below the surface? The diffusion coefficient for carbon in iron at this temperature is 1.6×10^{-11} m^2/s. Assume that the steel piece is sem-infinite. **[10]**

Given :

Z	erf(z)
0.30	0.3286
0.35	0.3794
0.40	0.4284
0.45	0.4755

Q2) The state of stress at a particular point relative to an xyz coordinate system is given by the stress matrix. **[10]**

$$[\sigma]=\begin{bmatrix} 14 & 7 & -7 \\ 7 & 10 & 0 \\ -7 & 0 & 35 \end{bmatrix} \text{MPa}$$

P.T.O.

Determine the normal stress and magnitude and direction of the shear stress on a surface intersecting the point and parallel to the plane given by equation $2x - y + 3z = 9$.

Q3) To ensure that the neck in a tensile bar would occur at the middle of the gauge section, the machinist made the bar with a 50 mm. diameter in the middle of the gauge section and machined the rest of it to a diameter of 50.5 mm. After testing, the diameter away from the neck was 0.470 in. Assume that the stress-strain relation follows the power law, equation $\sigma = K\in^{n}$.

What was the value of n? **[10]**

Q4) a) Explain Bend test. **[5]**

b) Explain different models of uniaxial behavior of material in plasticity. **[5]**

Q5) Explain Elastic-plastic torsion of a solid circular shaft. **[10]**

Q6) Explain Residual stresses and Residual Strain in cylinder in torsion. **[10]**

Q7) What is viscoelasticity? Explain Kelvin model of viscoelasticity. **[10]**

Total No. of Questions :7]

SEAT No. :

P4059

[Total No. of Pages : 2

[5255]-557

M.E (Mechanical) (Design Engineering)
ADVANCED STRESS ANALYSIS
(Semester - I) (2013 Credit Pattern) (502203)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions out of 7.***
2) ***All the questions should be solved in one answer book and attach extra supplements if required.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of calculator is allowed.***
5) ***Assume Suitable data if necessary, but state the assumptions clearly.***

Q1) Derive differential equations of equilibrium in polar Coordinates with neat diagram. **[10]**

Q2) a) Derive the expression for Modulus of elasticity for composite considering iso-stress & iso-strain condition. **[6]**

b) Explain typical failure modes of engineering plastics. **[4]**

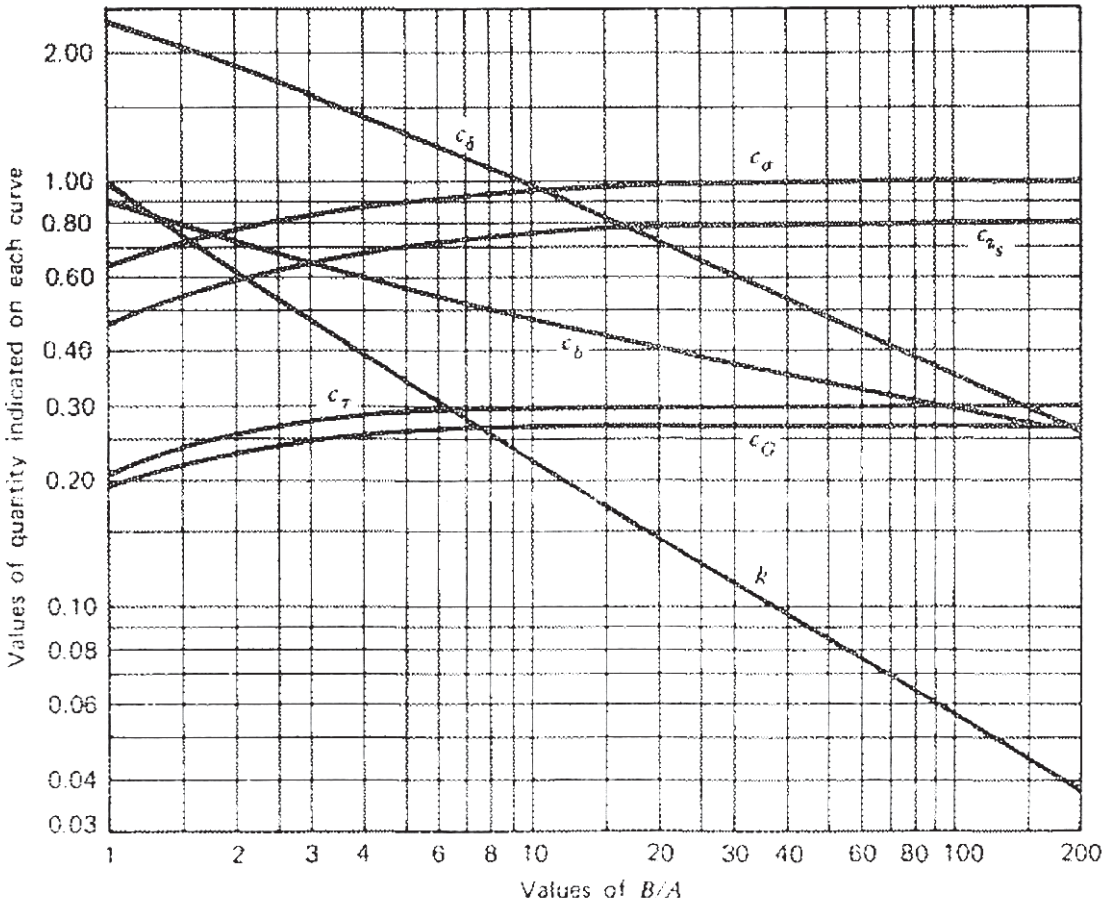
Q3) Explain different criteria of stress analysis for plasticity. **[10]**

Q4) For uniformly loaded 'q N/m' circular plate with clamped edges, derive the following expression.

$$W = \frac{q}{64D}(a^2 - x^2)^2$$ **[10]**

Q5) The two semicircular disks made of steel ($E_1 = E_2 = 200\,GPa$ and $\upsilon_1 = \upsilon_2 = 0.29$). The radii of curvature of the two surfaces at the point of contact are R_1 = 60 mm, R'_1 = 130 mm, R_2 = 80 mm, and R'_2 = 200 mm. The angle a between the planes of minimum curvature is $\pi / 3$ rad. If the load P=4.50 kN, Determine the maximum principal stress, maximum shear stress, and maximum octahedral shear stress in the disks and state the location of the point where each of these stresses occurs. (Refer Graph 1) **[10]**

P.T.O.



Q5) Graph 1: Stress and Deflection coefficient of two bodies in contact of a point

Q6) Investigate validity of the stress function $\phi=\left[\frac{H}{\pi}\right] y\tan^{-1}\left[\frac{x}{y}\right]$ were 'H' is a constant. Also, Determine the stresses. **[10]**

Q7) A rectangular strain gauge rosette records following strain during a test on structural member. **[10]**

$\varepsilon_A=-13\times10^{-6}, \varepsilon_B=7.5\times10^{-6}, \varepsilon_C=13\times10^{-6}$, meters/m.

Determine

i) Magnitude of principal strains

ii) Orientation of principal strains.

Total No. of Questions : 7]

SEAT No. :

P4060

[Total No. of Pages : 2

[5255] - 558

M.E. (Mechanical) (Heat Power / Design / Mechatronics / CAD/ CAM / Energy Engineering)

RESEARCH METHODOLOGY

(2013 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of pocket calculator and different gas charts as applicable is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) State and discuss the eight step model for Research Process starting from formulation of research problem till research report writing. **[5]**

b) Discuss the significance of Research in different fields in terms of benefit to society with suitable examples. **[5]**

Q2) a) What do you mean by Citation and Impact Factor of a Journal? Explain the significance of a Peer reviewed Journal Papers for literature review. Discuss the impact of referring open access non-peer reviewed Journals / websites on research process / Validation of results. **[5]**

b) Explain the term Plagiarism? How the Plagiarism in thesis / publications can be avoided. **[5]**

Q3) a) Explain the term variables and different types of variables used in Research. **[5]**

b) Discuss the common errors encountered in selecting a Research Problem. **[5]**

P.T.O.

Q4) a) Discuss the significance of validation of experimental results vis-à-vis mathematical modeling / Literature data. **[5]**

b) Write down the outline/structure of Research Proposal. What are the different government agencies which fund research projects. **[5]**

Q5) a) Discuss good measurement practice a researcher should follow during while measurement. **[5]**

b) Explain Curve fitting and regression analysis with suitable examples. **[5]**

Q6) a) Define : **[5]**

i) Range.

ii) Accuracy.

iii) Precision.

iv) Sensitivity.

v) Resolution.

vi) Threshold / Dead zone.

b) Fit the regression model for the following data for demand in thousand units of automobiles for last 16 years for a manufacturer where A-Year, B-Units sold in thousands. **[5]**

A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	172.8	116.2	156.8	134.4	144.9	123.9	122.6	126.7	111.5	147.1	139.1	149.8	161.6	151	152.4	172.8

Q7) a) How to select a suitable journal for publishing your work under Elsevier / Springer / IEEE / Taylor and Francis. Discuss steps in publishing a research paper in Peer reviewed Journal. **[5]**

b) Discuss the structure of a research paper published in a standard Journal under Elsevier. And also discuss formatting standards used in writing a research paper for Elsevier. **[5]**

Total No. of Questions :7]

SEAT No. :

P4061

[Total No. of Pages :2

[5255] - 559

M.E. (Mechanical - Design Engineering)

ANALYSIS AND SYNTHESIS OF MECHANISMS

(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 whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data whenever necessary.***

Q1) In a four bar linkage, **[10]**

$\theta_2 = 60°$ $\phi_4 = 90°$

$\omega_2 = 3$ rad/sec $\alpha_2 = -1$ rad/sec^2

$\omega_4 = 2$rad/sec $\alpha_4 = 0$ rad/sec^2

Determine dimensions of the link if fixed link is of 100 mm length.

Q2) A mechanism is shown in fig. 01. Determine angular velocity of O_6D and link BCD. Take $\omega_2 = 10$ rad/sec. **[10]**

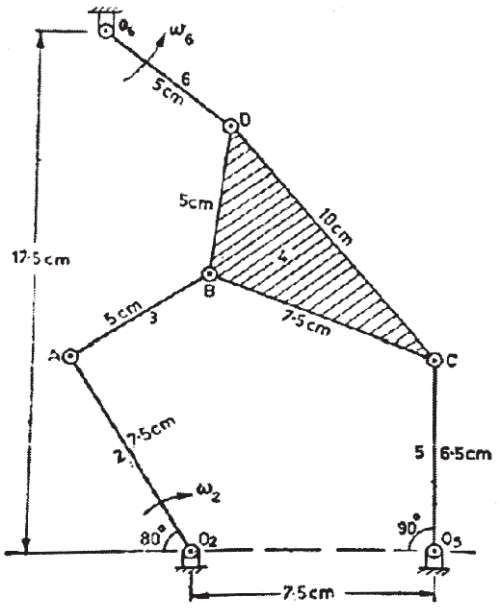


Fig. 01

P.T.O.

Q3) A four bar mechanism is shown in the Fig. 02. The dimensions are AD=AB=60 mm BC = CD = 25 mm. AD is the fixed link and E is midpoint of BC. Determine the centre of curvature of the point E. **[10]**

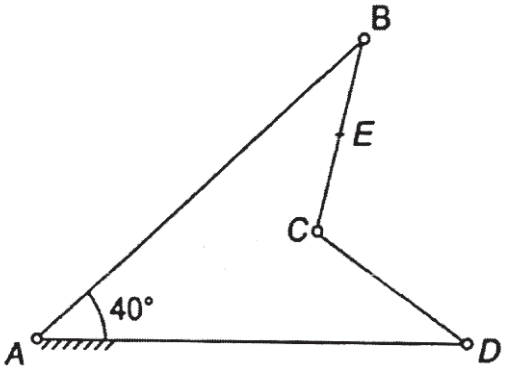


Fig. 02

Q4) a) What is elastic linkage model? Explain with neat sketches. **[5]**

b) Write element mass, stiffness and system matrices for a beam element modeling an elastic linkage. **[5]**

Q5) a) Consider a planar robot consisting of three moving links of lengths L_1, L_2 and L_3 . Write Denavit - Hartenberg parameters for the robot and express position of output link in terms of these parameters. **[7]**

b) What is inverse kinematics? **[3]**

Q6) Synthesize a four bar mechanism to generate a function $y = 3x + 3$ where $0 \leq x \leq 4$. Assuming initial and final positions of input link as 30° and 150° respectively, whereas for output link 40° and 150° respectively. Determine x, y, θ, ϕ corresponding to three precision positions. The grounded link is horizontal and of 10 cm in length. The crank is of 45 mm in length. Use three precision positions. **[10]**

Q7) a) Explain the following: **[3]**

i) Function generation.

ii) Path generation.

iii) Motion generation.

b) State any two forms of Euler - Savary equation and derive any one of them from the other. **[7]**

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Total No. of Questions : 7]

SEAT No. :

P4062

[Total No. of Pages : 3

[5255]-560

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

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Draw Neat diagrams wherever necessary.***
3) ***Use of non-programmable scientific calculator is allowed.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures to the right indicate full marks.***

Q1) Find the natural Frequency and mode shapes of three degree of freedom system as shown in Fig. Q. 1 using matrix method (Eigen values and eigen vector). **[10]**

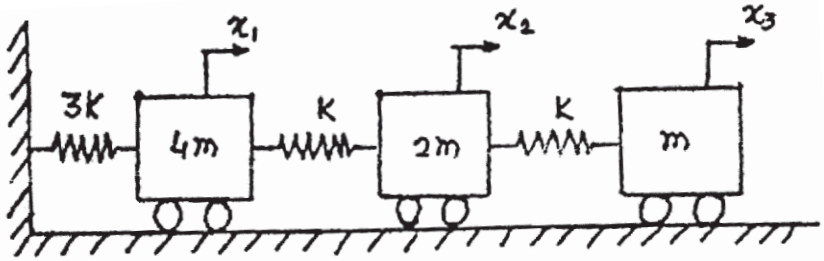


Fig. Q. 1

Q2) A bar fixed at one end is pulled at the other end with a force 'F' as shown in Fig. No. 2. The force is suddenly released. Investigate the vibration of the bar. **[10]**

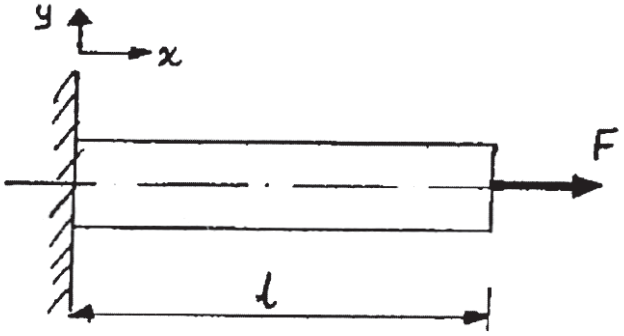


Fig. No. 2

P.T.O.

Q3) a) Derive the wave Equation for the transverse vibration of a string. **[5]**

b) Determine flexibility influence coefficient of the triple pendulum of lengths L_1, L_2, L_3 and masses m_1, m_2, m_3 attached by the string as shown in Figure No. 3. **[5]**

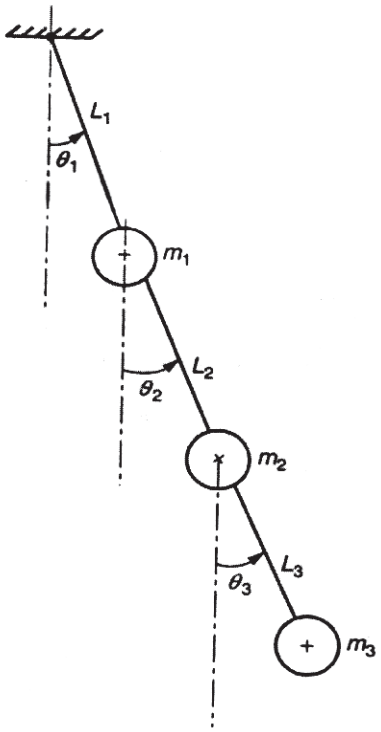


Figure No. 3

Q4) Derive expression for dimensionless displacements in un-damped dynamic vibration absorber in terms of the parameters of the system. For the tuned Absorber, show: **[10]**

a) The relationship between response speed and mass ratio

b) Frequency response curves for main system and absorber

Q5) a) State and explain different machine condition monitoring and machine vibration monitoring techniques. **[5]**

b) Explain significance of using FFT analyzer in vibration with its merits and demerits. **[5]**

Q6) a) Give three examples of random input. How will you proceed to find their Spectral Density? **[5]**

Calculate the Autocorrelation function corresponding to the ideal white noise and to the unit step function.

b) Explain with neat sketch wide-band and narrow band processes. Define white noise, ideal noise and band limited noise. **[5]**

Q7) Write notes on (Any Four): **[10]**

a) Free vibration of string with various boundary conditions

b) In-situ Balancing Method

c) Noise absorber

d) Influence coefficients

e) Auto correlation function

Total No. of Questions : 8]

SEAT No. :

P4063

[Total No. of Pages : 2

[5255]-561

M.E. (Mechanical) (Design Engineering)
FINITE ELEMENT METHOD
(2013 Credit Pattern) (Theory) (Semester - II) (502209)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions***
2) ***Neat diagrams should be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of scientific calculator is permitted.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain LINEAR shape functions. **[5]**

b) Describe sources of errors in FEM with suitable examples. **[5]**

Q2) Explain following terms in brief. **[10]**

a) Physical Model.

b) Mathematical model with differential equation.

c) FEM Model.

d) Element Matrix Equation.

e) Iso-parametric Equations.

Q3) Evaluate integral $I = \int_{-1}^{1} \left(x^3 - 4x^2 + 2x + 8\right) dx$ by **[10]**

a) Gauss 2 Point Formula

b) Gauss 3 Point Formula

Q4) a) Explain how node numbering affects the bandwidth of stiffness matrix in FEM. **[5]**

b) Differentiate between Galerkin and Rayleigh Ritz Finite element formulations. **[5]**

P.T.O.

Q5) Explain why a linear triangular element (CST) is a stiff element. Suggest suitable remedies for this element in industry practice. **[10]**

Q6) Compare Linear and Non-linear Finite Element Analysis with respect to **[10]**

a) Load-Displacement Relation.

b) Stress-Strain Relation.

c) Superposition.

d) Reversability.

e) Solution Scheme.

Q7) Classify different types of dynamic problems. Mention and Differentiate between implicit and explicit time integration schemes. **[10]**

Q8) Explain what do you understand by Submodeling and substructuring. Give practical examples where these approaches are useful. **[10]**

Total No. of Questions : 5]

SEAT No. :

P4064

[Total No. of Pages : 2

[5255]-562

M.E. (Mechanical Design Engineering)
OPTIMIZATION TECHNIQUES
(2013 Credit Pattern) (Semester - III) (602213)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Explain in brief classification of optimization problem? **[5]**

b) Define engineering optimization and explain the following terms **[5]**

i) Design Vector.

ii) Design Constraint.

iii) Objective Function.

Q2) Solve by simplex method the following L.P. Problem **[10]**

$Z = X_1 - 3X_2 + 3X_3$

Subjected to $3X_1 - X_2 + 2X_3 \leq 7,$

$2X_1 + 4X_2 \geq -12,$

$-4X_1 + 3X_2 + 8X_3 \leq 10$

$X_1, X_2, X_3 \geq 0$

Q3) Find the minimum of $f = \lambda(\lambda\text{-}1.5)$ in the interval (0.0, 1.00) to within 5% of exact value. **[10]**

P.T.O.

Q4) a) Minimize the function

$$f(X) = 0.65 - \frac{0.75}{1+X^2} - 0.65 * X \tan^{-1}\left(\frac{1}{X}\right)$$ Using Quasi-Newton method with the starting point $X_1 = 0.1$ and the step size $\Delta X = 0.01$ in central difference formulas. Use $\varepsilon = 0.01$ for checking the convergence. **[5]**

b) Explain any one in details. **[5]**

i) Fuzzy optimization.

ii) Simulated Annealing.

iii) Genetic algorithm.

Q5) a) What are the different methods involved in problem formulation and parameterization of design? Explain one method in details. **[5]**

b) Write a short note on Bi-directional evolutionary structural optimization based on Vonmisses stress. **[5]**

x x x

Total No. of Questions : 8]

SEAT No. :

P4065

[Total No. of Pages : 2

[5255]-563

M.E. (Mechanical) (Design Engineering)

MECHANICAL MEASUREMENTS & CONTROL

(2013 Course) (Semester - III) (602214)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Explain calibration & Necessity of calibration. **[5]**

b) Explain null & deflection type of instruments. **[5]**

Q2) a) Define **[6]**

i) Mean

ii) Median

iii) Standard Deviation

iv) Variance

b) Write note on Systematic Errors. **[4]**

Q3) a) By using following data find lines of regression & compute Karl Pearson coefficient of correlation. **[6]**

$\Sigma x = 15000$ $\Sigma y = 6800$ $\Sigma xy = 1022250$ $\Sigma x^2 = 2272500$ $\Sigma y^2 = 463025$ $n = 100$

b) Explain different types of correlation. **[4]**

Q4) a) Explain construction & working of RTD. **[5]**

b) Explain any one instrument used for noise measurement. **[5]**

P.T.O.

Q5) a) How radiation and surface properties can be measured. **[5]**

b) List out various instruments for frequency measurement. Explain stroboscope in detail. **[5]**

Q6) a) Represent a generic state space model using the block diagram approach and define the elements of the block diagram. **[5]**

b) Explain Poles and Zeros of System. Explain Lyapunov's criterion for stability of system. **[5]**

Q7) a) Characteristic equation of the system is given $S^4 + 3S^3 + 3S^2 + 2S + K = 0$. Find value of K, if system is stable, using Routh Hurwitz criterion. **[5]**

b) Derive the governing differential equation for the following electro-mechanical system(dc motor) shown in figure Q7(B)**[5]**

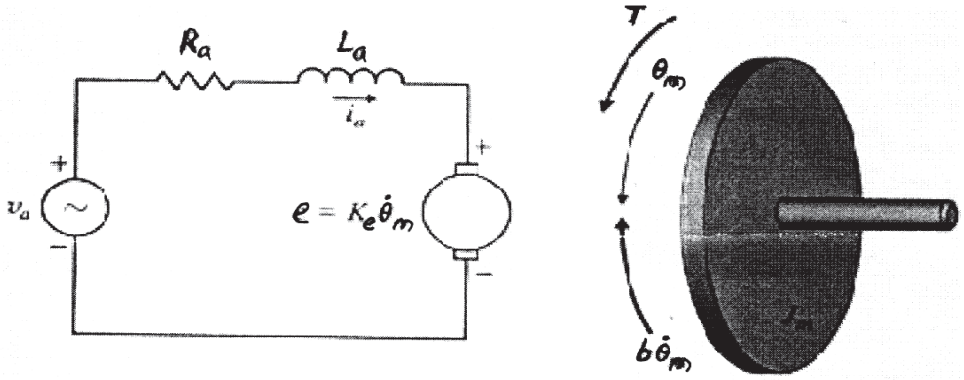


Figure Q7 (B)

Q8) a) Explain Proportional + Integral + Derivative control action. **[5]**

b) Figure Q8 (B) shows an error time graph. Sketch the PD controller output w.r.t. time K_p = 5%/%, KD = 0.5%/s and m(0) = 20%. **[5]**

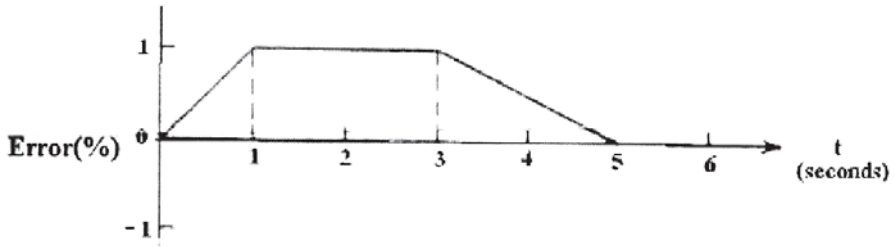


Figure Q8 (B)

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

P4066

[Total No. of Pages : 3

[5255]-564

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

Time : 3 Hours] *[Max. Marks : 50*

Instruction to the candidates:

1) ***Answer 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) Using Newton-Raphson method find the real root of the equation $x \log_{10} x = 1.2$ correct to four decimal places. **[5]**

b) Fit a second degree parabola for the following data by using method of least squares. **[5]**

x	10	12	15	23	20
y	14	17	23	25	21

Q2) a) Using LU Decomposition method solve the system of equations: **[5]**

$x + y + z = 9$

$2x - 3y + 4z = 13$

$3x + 4y + 5z = 40$

b) Find Lagrange's interpolating polynomial for the data:

x	0	1	3	4
y	–12	0	6	12

Also find 'y' at $x = 2$ **[5]**

P.T.O.

Q3) a) Find the equation of cubic curve which passes through the points (4, –43); (7, 83); (9, 327) and (12, 1053) by using Newton's divided difference formula. **[5]**

b) Using Hermite's interpolation formula find sin (1.05) for the data: **[5]**

x	1.0	1.1
y = sin x	0.84147	0.89121
y' = cos x	0.5403	0.45360

Q4) a) Evaluate $\int_0^{\pi/2} \sin x\,dx$ by Gaussian quadrature 3-point formula. **[5]**

b) Using power method find the numerically largest eigen value of $A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$. **[5]**

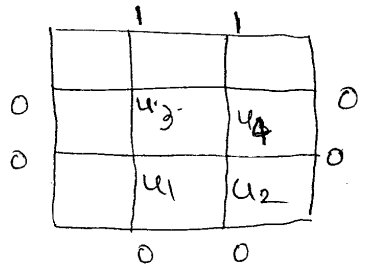
Q5) a) Using Given's method reduce the following matrix to the tridiagonal form. $A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 4 & 2 \\ 3 & 2 & 3 \end{bmatrix}$. **[5]**

b) Apply Runge-Kutta method to find approximate value of y at $x = 0.4$ in step of 0.2, given that $\frac{dy}{dx} = 1 + y^2, y(0) = 0$. **[5]**

Q6) a) Use Adams-Bashforth method to find y(1.4) given that $\frac{dy}{dx} = x^2(1 + y)$ and use following. **[5]**

x :	1	1.1	1.2	1.3
y :	1	1.233	1.548	1.979

b) Use Jacobi's iteration method to solve the partial differential equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ represented by a mechanical system (carry out five iterations). Given that **[5]**



Q7) a) Solve $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$, for the following condition using Crank-Nicolson method. **[5]**

At $x = 0$ and $x = 3$, $u = 0$ for all values of t at $t = 0$, $u = x^2$ for $0 < x < 3$. Take increment in x as 1 and in t as 0.1. Find all values of u for $t = 0$ to $t = 0.3$.

b) Using Gauss-Seidel iteration and first iteration as (0,0,0), calculate the next 3 iterations for the following system of equations: **[5]**

$5x - y + z = 10$

$2x + 8y - z = 11$

$-x + y + 4z = 3$

Q8) a) Use the finite difference method to solve the wave equation for a vibrating string **[5]**

$u_{tt}(x,t) = 4u_{xx}(x,t)$

for $0 \leq x \leq 4$ & $0 \leq t \leq 2$ using boundary conditions $u(0,t) = u(4,t) = 0$, $t > 0$ and the initial conditions: $u(x, 0) = x(4 - x)$, $0 \leq x \leq 4$, & $u_t(x,0) = 0$ Assume $h = 1$ and $k = 0.5$.

b) What do you understand by the term 'boundary value problems'? Explain the shooting method with suitable example to solve boundary value problem. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4067

[Total No. of Pages : 3

[5255] - 565

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

ADVANCED THERMODYNAMICS & COMBUSTION TECHNOLOGY

(2013 Course) (502102) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) A cylinder of volume $0.1m^3$ contains 7 kg ethane at 70 bar. Using compressibility chart, estimate temperature of ethane.

Critical Properties : $T_c = 305.5$ K, $P_c = 4.48$ M Pa. **[4]**

b) Explain deviation of Real Gases from Ideal Gases. **[3]**

c) Explain State Postulate for simple system. **[3]**

Q2) a) Explain Nernst heat theorem and thermal death of universe. **[3]**

b) Discuss P-V and P-T diagrams. **[4]**

c) A 0.3 kg metal bar initially at 1200 K is removed from an oven and quenched by immersing it in a closed tank containing 9 kg of water initially at 300 K. Each substance can be modeled as incompressible. An appropriate constant specific heat value for the water is 4.2 kJ/kg. K, and an appropriate value for the metal is 0.42 kJ/kg.K. Heat transfer from the tank contents can be neglected. Determine the amount of entropy produced, in kJ/K. **[3]**

P.T.O.

Q3) a) Derive an expression for availability of a steady flow system. **[4]**

b) Air is available at 10 bar and 1500 K for expansion through an adiabatic turbine. At the exit, the air pressure is 1 bar and temperature is 900 K. What maximum possible work this turbine can produce? Also find irreversibility and Second Law Efficiency. The ambient conditions are 1 bar and 300 K. Neglect KE and PE changes. Assume $1.4\ C_v = C_p = 1.0045$ kJ/kg.K. **[6]**

Q4) a) Write a note on 'Increase of Entropy Principal'. **[5]**

b) 3 kg of gas ($C_v = 0.81$ kJ.kg K) initially at 2.5 bar and 400 K receives 600 kJ heat from infinite source at 1200 K in constant volume process. If surrounding temperature is 290 K, find loss in available energy due to above heat transfer. **[5]**

Q5) a) State and prove reciprocity relation. **[5]**

b) With usual notations derive the following thermodynamic relation : **[5]**

$C_p - C_v = TV\beta^2/k_T$.

Q6) a) What is adiabatic flame temperature? **[4]**

b) Determine the enthalpy of combustion of liquid octane (C_8H_{18}), in kJ per kg of fuel, at 25ºC, 1 atm with liquid water in the products. **[6]**

Take : Enthalpy of formation at 25ºC and 1 atm for

i) $CO_2 = -393520$ kJ/kmol,

ii) $H_2O = -285830$ kJ/kmol, and

iii) $C_8H_{18} = -249950$ kJ/kmol.

Q7) a) Explain : Enthalpy of formation and enthalpy of combustion. **[4]**

b) The molar analysis of the gaseous products of combustion of a certain hydrocarbon fuel is CO_2, 0.08; H_2O, 0.11; O_2, 0.07 and N_2, 0.74. Determine the apparent molecular weight of the mixture and the composition in terms of mass fractions. **[6]**

Q8) a) Discuss : Thermodynamics of Biological Cells. **[4]**

b) Write short note on : **[6]**

i) Thermodynamics of Nutrition and Exercise.

ii) Gibb's phase rule.

Total No. of Questions :7]

SEAT No. :

P4068

[Total No. of Pages : 2

[5255]-566

M.E. (Mechanical-Heat Power Engg.)
ADVANCED FLUID MECHANICS
(2013 Credit Pattern) (Semester - I) (502103)

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 a generalized expression for total derivative and deduce the same for velocity, density, temperature and pressure. **[5]**

b) Write an expression of law of conservation of momentum in integral form. A 30 cm diameter horizontal pipe terminates in a nozzle with the exit diameter of 7.5 cm. If the water flows through the pipe at a rate of .15 m^3/s, what force will be exerted by the fluid on the nozzle? **[5]**

Q2) a) Derive an expression for conservation of momentum equation in following form;

$$\rho \frac{D\bar{V}}{Dt} = \bar{f}$$ **[5]**

b) Write a short on Vorticity, velocity Potential and Stream function. **[5]**

Q3) a) Deduce the expression of Bernoulli Equation from Navier stokes equation. **[5]**

b) Obtain exact solution of fully developed flow between fixed parallel plates. **[5]**

P.T.O.

Q4) a) A source with strength 0.25 m^2/s and a vortex with strength $1m^2/s$ (anticlockwise) are located at the origin. Determine the equation for stream function and velocity potential. Also work out the velocity components at a point P(1, 0.5) **[5]**

b) Derive an expression for lift on rotating cylinder. (Kutta-Joukowsky theorem). **[5]**

Q5) a) Write a short note on " Separation of Boundary - layer". **[5]**

b) A general sinusoidal velocity profile for laminar boundary - layer flow on a flat plate can be taken as $u = A \sin (By) + C$. State the three boundary conditions applicable to the velocity profile, and thus evaluate the constants A, B, C. **[5]**

Q6) a) Explain different types of free turbulent flows. What is a need of turbulence modeling? **[5]**

b) Derive an expression of velocity profile in a smooth pipe for turbulent flow. **[5]**

Q7) a) Derive an expression for speed of sound. What is the Mach number of flow of air of velocity 200m/s at 400K? State the types of flow. **[5]**

b) Derive an expression for Fanno line & Rayleigh line for normal shock. **[5]**

Total No. of Questions :7]

SEAT No. :

P4069

[Total No. of Pages :2

[5255] - 567

M.E. (Mechanical - Heat Power)

ADVANCED HEAT TRANSFER

(2013 Pattern) (Semester - II) (502107)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer five questions from following.***
2) ***Draw diagrams wherever necessary.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data wherever necessary.***

Q1) a) Derive an expression of Generalize heat conduction equation and describe various Boundary and Initial Conditions. **[7]**

b) A black metal plate (k= 25 W/m.K) at 300ºC is exposed to surrounding air at 30ºC. It convects and radiates heat to surroundings. If the convection coefficient is 25 $W/m^2.K$, what is the temperature gradient in the plate.?[29] **[3]**

Q2) a) Construct lumped system analysis equation in terms of dimensionless parameters. Explain the significance of dimensionless parameters in the equation. **[5]**

b) An ordinary egg can be approximated as a 5.5 - cm diameter sphere whose properties are roughly k =0.6 W/m.ºC and $\alpha = 0.l4 \times 10^{-6}$ m^2/s. The egg is initially at a uniform temperature of 8ºC and is dropped into boiling water at 97ºC. Taking the convection heat transfer coefficient to be h = 1400 $W/m^2 \cdot$ºC, determine how long it will take for the center of the egg to reach 70ºC.

Take $\lambda_1 = 3.0877$, $A_1 = 1.9969$. **[5]**

P.T.O.

Q3) a) Derive an expression for convection heat transfer. State boundary layer approximations. **[5]**

b) Write a short note on " Reynolds Analogy & Chilton-Colburn analogy. **[5]**

Q4) a) The local atmospheric pressure at Mahabaleshwar hill station in Maharashtra is 83.4 kPa. Air at this pressure and 20ºC flows with a velocity of 8 m/s over a 1.5 m × 6 m flat plate whose temperature is 134ºC. Determine the rate of heat transfer from the plate if the air flows to

i) 6 m long side and

ii) the 1.5 m side. Take $k_f = 0.030$ W/m - K Pr = 0.697, $v = 2.094 \times 10^{-5}$ m^2/s **[5]**

b) Prove that for laminar flow through a pipe under constant heat flux condition, Nu= 4.36. **[5]**

Q5) a) A flat plate solar collector has 16 m high and 1 m wide and 8 cm depth is tilted at 40ºC to the horizontal. The inner wall is at 70ºC and the outer wall at 10ºC and the enclosure is filled with air at 1 atm. Estimate the heat loss. **[5]**

b) A pipe caring steam runs in a large room and is exposed to air at a temperature of 30ºC. The pipe surface temperature is 200ºC. The pipe diameter is 20 cm. If total heat loss from the pipe per meter length is 1.9193kW/m, determine the pipe surface emissivity. Use correlation

$Nu = 0.53 (Gr.Pr)^{(1/4)}$ [k_f= 0.03306 W/m - K Pr = 0.687, $v = 24.93 \times 10^{-6}$ m^2/s

[5]

Q6) Derive an expression for heat transfer coefficient for laminar film condensation over vertical flat plate. **[10]**

Q7) a) Discuss various "View Factor Relations". **[5]**

b) Explain the concept of solid angle & radiosity. **[5]**

☼ ☼ ☼

Total No. of Questions : 7]

SEAT No. :

P4070

[Total No. of Pages : 4

[5255]-568

M.E. (Mechanical - Heat Power Engg.)
AIR CONDITIONING TECHNOLOGY
(2013 Course) (502108) (Semester-II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions out of seven.***
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, if necessary.***
5) ***Figures to the right indicate full marks.***

Q1) a) The outdoor dry bulb and wet bulb temperatures are 38°C and 28°C respectively. The indoor design conditions of an operation theatre and anaesthesia room are 24°C and 50% RH. The RSH and RLH are 15 kW and 3 kW respectively. The fresh air requirement is 50 cmm. Find the supply air DBT and the dehumidified air quantity. Assume bypass factor as 0.05. **[6]**

b) Write a note on Air Washer. Which psychrometric process is not possible using Air Washer. **[4]**

Q2) The following information is related to a Laboratory application. **[10]**

Outdoor design : 32°C DBT, 13 gms/kg of dry air

Indoor design: 24°C DBT, 10 gms/kg of dry air

RSH = 35 kW, RLH = 19kW, ventilation air quantity: 71 m^3/min.

The temperature difference between room air and supply air is 11°C maximum.

Find:

i) ESHF,

ii) ADP,

iii) Reheat required with revised ESHF = 0.74,

iv) Supply air quantity,

v) Grand total heat.

P.T.O.

Q3) A bank building is to be designed for 100 people. The size of the building is 20×16×5 m height, with all walls directly exposed to outside air. Outdoor conditions are 42°C DBT and 27°C WBT. Inside conditions are 22°C and 50% RH. Lighting load is 3 kW and electrical appliances load is 2 kW. Assume following parameters: **[10]**

i) Solar gain through glass is 10% of solar gain through walls and roof. Neglect heat gain from floor.

ii) Sensible heat per person is 70 W and latent heat per person is 45 W. Assume ventilation air quantity as 21 cmm.

iii) Assume U value for wall as 1.5 W/m^2K and U value for roof as 2.0 W/m^2K. Temperature corrections (ETD) need not be applied while calculating solar gain through wall and roof.

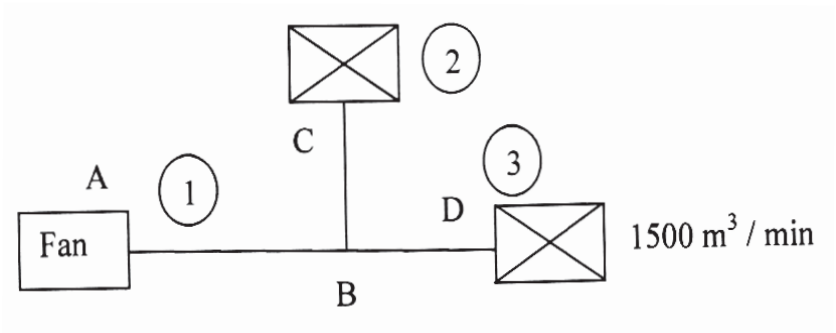
iv) Neglect Infiltration and assume Bypass Factor of coil as 0.1.

v) Take 10% safety for overall sensible load and 5% safety for overall latent load. Determine:

1) Air Conditioning load in TR and dehumidified air quantity.

2) Suggest a suitable air conditioning system for the above with justification.

Q4) An air duct system is provided as shown below: **[10]**



Section AB, BC and BD all are 2 m × 1 m. Length AB is 50 m, length BC is 50 m and length BD is 60 m.

Quantity of air discharged at D is 1500 m^3/min. Assuming the value of friction factor as 0.0048 find:

i) Quantity of air discharged at 'C'

ii) Static pressure at fan outlet 'A'

Q5) a) WBT is important for evaporative cooling applications. Do you agree? Justify your answer. **[5]**

b) What are the important considerations for hospital air conditioning? **[5]**

Q6) a) Compare single stage and two stage evaporative cooling using Psychrometric chart. **[5]**

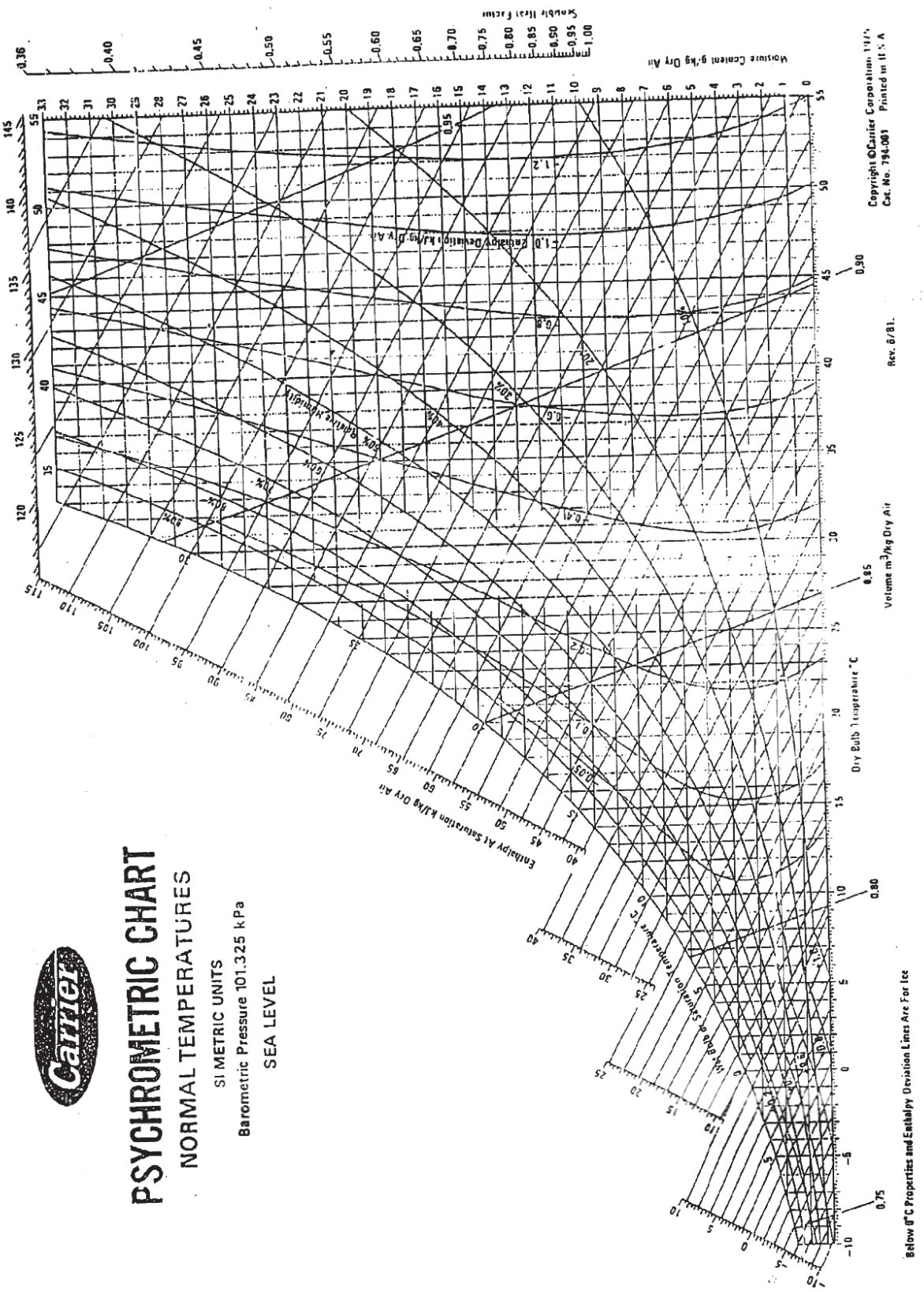
b) Desert air cooler is used to cool the air from 40°C DBT and 15% RH to 25°C by Evaporative cooling. Estimate the volume flow rate of air in m^3/min and the quantity of water required per hour for a cooling capacity of 4 TR. Assume efficiency of evaporative cooler as 90%. **[5]**

Q7) a) Differentiate between: **[6]**

i) Infiltration and Ventilation

ii) DPT and WBT

b) What are the references for selecting outdoor and indoor climatic conditions while performing air conditioning load calculations? **[4]**


Carrier
PSYCHROMETRIC CHART
NORMAL TEMPERATURES
SI METRIC UNITS
Barometric Pressure 101.325 kPa
SEA LEVEL
Enthalpy At Saturation kJ/kg Dry Air
Dry Bulb Temperature °C
Volume m³/kg Dry Air
Moisture Content g/kg Dry Air
Sensible Heat Factor
Below 0°C Properties and Enthalpy Deviation Lines Are For Ice
Rev. 6/81.

Total No. of Questions : 7]

SEAT No. :

P4071

[Total No. of Pages : 2

[5255]-569

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

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Solve any Five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator, heat transfer data book, steam table is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain the instrument types giving suitable example. **[5]**

b) Explain hysteresis effect and dead space? With example, explain its effect on instrument performance. **[5]**

Q2) a) What do you mean by first order and second order instrument? Explain in detail. **[5]**

b) The measurements in a data set are subject to random errors but it is known that the data set fits a Gaussian distribution. Use standard Gaussian tables to determine the percentage of measurements that lie within the boundaries of $\pm 1.5\sigma$, where σ is the standard deviation of the measurements. How many measurements have a deviation greater than $|\sigma|$ and $|2\sigma|$? **[5]**

Q3) a) A fan performance test yields the following data:

Q:	2000	6000	10000	14000	18000	22000
h:	5.56	5.87	5.73	4.95	3.52	1.08

Where Q is flow rate in m^3/s and h is static head in cm-H_2O. Find the lowest-degree polynomial that best fits the data as h = f(Q). **[5]**

b) How the cumulative errors are evaluated in the following cases? Sum, difference, product and quotient. **[5]**

P.T.O.

Q4) a) Draw and explain the working of digital multimeter. **[5]**

b) Explain how thermocouples are used to measure temperature difference. **[5]**

Q5) a) Explain the working of Laser Doppler Anemometer. **[5]**

b) Explain the working of P-I-D pneumatic controller. **[5]**

Q6) a) Why Gardon gauge is used? With neat diagram explain its working. **[5]**

b) Explain working of velocity transducer. What are the merits and demerits of displacement transducer over velocity transducer? **[5]**

Q7) Explain the usage of the following instruments. What are the limitations of its usage? (Any five) **[10]**

a) Pitot tube.

b) Pressure gauge - differential.

c) Anemometer - rotating vane type.

d) Flow measuring hood.

e) Optical tachometer.

f) Thermocouple.

g) U-tube manometer.

Table 1: Standard Gaussian Table

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
					$F(z)$					
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7703	0.7734	0.7764	0.7793	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8906	0.8925	0.8943	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9648	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9924	0.9926	0.9928	0.9930	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964

Total No. of Questions : 7]

SEAT No. :

P4072

[Total No. of Pages : 2

[5255]-570

M.E. (Mechanical) (Heat Power Engineering)
COMPUTATIONAL FLUID DYNAMICS
(2013 Pattern) (Semester - III) (602113)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answers any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data, if necessary and mention it clearly.***

Q1) a) Derive the following governing equation. Comment on the physical principle on which it is based on. **[7]**

$$\frac{\partial(\rho u)}{\partial t}+\nabla.(\rho u V)=-\frac{\partial p}{\partial x}+\rho f_x$$

b) Explain the Reynolds Transport equation. Obtain the conservative form of continuity equation in integral form by simplifying Reynolds Transport equation. Explain each term in detail. **[3]**

Q2) a) Discretize the second order partial differential term with suitable discretization method and show that **[5]**

$$\frac{\partial^2 u}{\partial x^2}=\frac{2u_i-5u_{i+1}+4u_{i+2}+u_{i+3}}{(\Delta x)^2}$$

b) Consider a 1-D heat conduction problem and derive an expression for temperature distribution in a one dimensional fin using finite volume method. **[5]**

Q3) a) What is grid transformation? Why it is necessary? Derive and explain general transformation equations $\partial/\partial x, \partial/\partial y$ and $\partial/\partial t$ for two dimensional flow. Use intrinsic co-ordinate system at ξ, η and τ corresponding to x, y and t. **[5]**

b) Write an algorithm to generate unstructured 2D grid using advancing front grid generation. **[5]**

P.T.O.

Q4) Write the Euler equation in generic conservation form and explain each term.

Discretize following equations $\frac{\partial u}{\partial t} + c\frac{\partial u}{\partial x} = 0$ **[10]**

Using

a) Upwind scheme

b) Lax-wendroff scheme and

c) MacCormack scheme

Q5) a) Simplify the two dimensional Navier Stokes equations in differential form using Stokes assumptions to convert shear stress term into velocity components and viscosity terms i.e. dynamics viscosity (μ) and second viscosity (λ). **[5]**

b) What are the different convergence acceleration techniques? Write any one in detail. **[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. **[7]**

b) Classify turbulence modeling. Explain suitability of two equations model for internal and external problems. **[3]**

Q7) a) Explain how CFD analysis will contribute in the context of following examples **[5]**

i) Brake pad heat dissipation.

ii) Electronic cooling.

b) CFD Post-processing is an important tool to study and analyze the fluid flow and heat transfer behaviour. **[5]**

i) Write in detail the post-processing and its importance in CFD analysis process.

ii) Enlist the different tools in post processing in CFD to analyze the fluid flow and heat transfer.

Total No. of Questions : 7]

SEAT No. :

P4073

[Total No. of Pages : 3

[5255]-571

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

DESIGN OF HEAT TRANSFER EQUIPMENTS

(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 side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Write in short TEMA standard used in heat exchanger design. **[5]**

OR

Give the detailed classification of heat exchangers.

b) Explain in detail the Bell Delaware Method for heat exchanger design. **[5]**

Q2) a) Two fluids A and B exchanges heat in a counter flow heat exchanger. Fluid A enters at 120°C and has a mass flow rate of 1 kg/s. Fluid B enters at 20 ºC and has a mass flow rate of 1 kg/s. The effectiveness of heat exchanger is 75%. Determine **[5]**

i) The heat transfer rate

ii) The exit temperature of fluid B. Given C_{pa} = 1 kJ/kg.K and C_{pb} = 4 kJ/kg.K

b) Draw the temperature distribution in heat exchanger for following configuration **[5]**

i) Cross flow

ii) Evaporator

iii) Two shell pass One tube pass

iv) Counter flow heat exchanger

P.T.O.

Q3) a) List down the different losses in the heat exchangers. How these losses affect the performance of the heat exchangers? **[5]**

b) What are the different methods to enhance the heat transfer coefficient? Explain any one in detail. **[5]**

Q4) a) Explain in detail any one method to find the heat transfer coefficient with its limitations. **[5]**

b) In a large steam power plant a shell and tube type of condenser is used which has the following data: Heat exchange rate 2100 MW; Number of shell pass= 1; Number of tubes 31500; Number of tube passes= 2; Diameter of each tube 25 mm; The condensation temperature =50ºC; Mass flow rate of cooling water 34000 kg/s; Heat transfer rate on steam side = 11400 W/m^2K; Inlet water temperature 20°C; Using LMTD-correction factor method and ε-NTU method. calculate **[5]**

i) The outlet temperature of the cooling water.

ii) The length of tube pass. Properties of water at 27°C are; Cp=4.18 kJ/kg.K, $\mu=885\times10^{-6}$ Ns/m^2; k = 0.613 W/m.K and Pr = 5.83

Q5) a) Explain in details different parameters considered in the designing and selection of the cooling tower. **[5]**

b) Enlist the different types of cooling towers used in industrial applications. Explain any one type in refrigeration application. **[5]**

Q6) a) What are the different types of furnaces used in the industrial applications? Explain induction furnace in detail with application. **[5]**

b) The suitable furnace is to be designed for the Bakery application. With suitable assumptions and capacity explain the steps involved in the furnace design. **[5]**

Q7) Write a short note on(Any Three) **[10]**

a) Thermal interface materials

b) Heat pipe

c) Heat transfer augmentation techniques

d) Electronic cooling systems

e) Use of nano particles in heat transfer equipments

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Total No. of Questions : 7]

SEAT No. :

P4074

[Total No. of Pages : 2

[5255] - 572

M.E. (Mechanical) (Automotive Engineering)

AUTOMOTIVE ENGINE DESIGN

(2013 Credit Pattern) (502302) (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 indicates full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculators and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) When a three-cylinder, four-stroke cycle, SI engine, operating at 4000 RPM is connected to an eddy current dynamometer. 70.4 kW of power is dissipated by the dynamometer. The engine has a total displacement volume of 2.4 liters and a mechanical efficiency of 82% at 4000 RPM. Because of heat and mechanical losses, the dynamometer has an efficiency of 93%. Dynamometer efficiency = (power recorded by dynamometer) / (actual power from engine). Calculate : **[10]**

a) Power lost to friction in engine.

b) Brake mean effective pressure.

c) Engine torque at 4000 RPM.

d) Engine specific volume.

Q2) A four-cylinder, 2.5-liter, SI automobile engine operates at WOT on a four-stroke air-standard Otto cycle at 3000 RPM. The engine has a compression ratio of 8 : 6 : 1, a mechanical efficiency of 86%, and a stroke-to-bore ratio S/B = 1.025, Fuel is isooctane with AF = 15, a heating value of 44,300 kJ/kg, and combustion efficiency = 100%. At the start of compression stroke, conditions in the cylinder combustion chamber are 100 kPa and 60ºC. It can be assumed that there is a 4% exhaust residual left over from the previous cycle.

Do a thermodynamic analysis of this engine for following parameters clearance volume, bore, stroke, temperature, pressure and volume of each state, heat added per cycle to each cylinder, indicated thermal efficiency. **[10]**

P.T.O.

Q3) a) Explain various types of combustion chambers of CI engines. **[5]**

b) What are different emission pollutants from engine emissions and explain EGR? **[5]**

Q4) Explain any three alternate fuels which can be used in engines, along with their advantages and disadvantages. **[10]**

Q5) Explain in detail various forces acting on piston and steps in piston design. **[10]**

Q6) With neat diagram explain procedure of design of cooling system. **[10]**

Q7) a) Explain factors to be considered in general engine design. **[5]**

b) What is square engine, explain selection of bore to stroke ratio for various applications? **[5]**

Total No. of Questions :7]

SEAT No. :

P4075

[Total No. of Pages : 2

[5255]-573

M.E (Mechanical) (Automotive engineering)
AUTOMOTIVE SAFETY AND REGULATIONS
(2013 Course) (Semester - I) (502303)

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) Compare the sequence of events in frontal and side impact. Identify injury mechanisms. **[5]**

b) Describe regulatory requirements for crash testing? **[5]**

Q2) a) What is pedestrian safety? Justify need of it. Explain pedestrian accidents observed by hitting various vehicles causing fatal and non-fatal injuries.**[5]**

b) Explain with neat sketch anthropometry data for passenger compartment or modern day's car. **[5]**

Q3) a) Draw sketch of a typical seat and driver while seated in automobile fully belted? Indicate the directions of forces on various body parts and seat belt anchorage system. **[5]**

b) What are the functions of car bumper? Explain various requirements of crashworthiness of it. **[5]**

Q4) a) Explain briefly construction and working principle of head lamp its testing procedure as per CMVR Rule. **[5]**

b) Explain asymmetrical beam used in head lamp. What is merits and demerits of plastic lens head lamps? **[5]**

P.T.O.

Q5) a) Write a detail note on various automotive standard giving procedure for type approval and conforming safety of critical components. **[5]**

b) Describe various passive safety regulations adopted in India as per IS/AIS. **[5]**

Q6) a) Name the different types of environments test defined in Indian standards for evolution of lighting and signaling devices, explain them. **[5]**

b) Describe role of side door intrusion beam in providing passive safety in cases of side impacts. **[5]**

Q7) Write short notes on the following (Any two). **[10]**

a) Anthropometry data for automobile occupancy.

b) Role of seat belt in protection against whiplash injury.

c) AFLS.

d) Sketch any three road signs specifying dimensions and color code as per CMVR rule.

Total No. of Questions :7]

SEAT No. :

P4076

[Total No. of Pages :2

[5255] - 574

M.E. (Mechanical - Automotive Engineering)

ENGINE COMBUSTION TECHNOLOGY

(2013 Pattern) (Semester - II) (502307)

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 scientific calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Volumetric analysis of products of combustion of fuel is as under CO_2 = 12.5%, CO = 0.3 %, O_2 = 5%, and rest is N_2 Determine **[6]**

i) Air fuel ratio.

ii) Fuel consumption on mass basis.

iii) Percentage of excess air.

b) Explain laminar flame propagation in engine. **[4]**

Q2) a) Fuel (C_7H_{16}) is burned with 91 % l stiochiometric air write **[6]**

i) Combustion equation (Stoichiometric).

ii) Combustion equation (Actual).

iii) Air fuel ratio and fuel air ratio.

iv) Equivalence ratio.

b) Explain chemical equilibrium and dissociation. **[4]**

P.T.O.

Q3) a) Explain stratified charge combustion. **[5]**

b) Explain the concept of combustion quality. **[5]**

Q4) a) Compare the phenomenon of detonation in SI engine with phenomenon of diesel knock. **[5]**

b) Discuss the effect of following engine variables on flame propagation. **[5]**

i) Engine load.

ii) Compression ratio.

iii) Fuel air ratio.

Q5) a) Compare air swirl in CI engine with turbulence in SI engine. **[5]**

b) Explain IC engine simulation. **[5]**

Q6) a) Describe briefly factors affecting combustion chamber performance in gas turbine. **[5]**

b) With neat sketch explain combustion chamber geometry bringing out the various zones that play part in the process of combustion. **[5]**

Q7) Write short notes on (Any two): **[10]**

a) Adiabatic flame temperature.

b) Diesel smoke and control.

c) Surface ignition .

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Total No. of Questions : 5]

SEAT No. :

P4077

[Total No. of Pages : 2

[5255] - 575
M.E. (Mech. - Automotive)
NOISE VIBRATION AND HARSHNESS
(Semester - II) (2013 Course) (502308)

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 indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Solve any Two questions

a) Explain the Effect of noise on human beings? **[5]**

b) What is the difference between FFT and CPB analysers? **[5]**

c) The sound pressure level measured at 10m from an automobile horn is 110 dB. Determine the sound pressure level at distance of

i) 20 m

ii) 80 m. Assume that the inverse square law holds good between intensity and distance. **[5]**

Q2) Solve any Two questions

a) Explain the Pass by Noise measurement method for Vehicle. **[5]**

b) Show that as the distance from a point source doubles, the sound intensity level decreases by 6 dB **[5]**

c) Explain why noise source identification is required and what the different methods are available? **[5]**

Q3) Solve any Two questions

a) What do you mean by sound intensity mapping? What is its significance in NVH? **[5]**

b) Explain in detail different sound fields and state its significance. **[5]**

P.T.O.

c) The lower and upper frequencies an octave band are 11,312 and 22,614 Hz. Determine **[5]**

i) The central frequency of the 1/1 octave band

ii) The intermediate frequency of the 1/2 octave band, and

iii) The intermediate frequencies of the 1/3 octave band

Q4) Solve any Two questions

a) Explain Impedance tube (Kundt's tube) method (ASTM E1050) with Figure **[5]**

b) Explain in details of Experimental Modal Analysis. **[5]**

c) Explain the working of Helmholtz resonator type Muffler **[5]**

Q5) Write a Short Note (Any two)

a) Digital signal processing technique. **[5]**

b) Anechoic chamber and Reverberation chamber. **[5]**

c) Occupational Safety and Health Act (OSHA) of 1970. **[5]**

Total No. of Questions : 7]

SEAT No. :

P4078

[Total No. of Pages : 2

[5255]-576

M.E. (Mechanical) (Automotive Engineering)
AUTOMOTIVE CHASSIS DESIGN
(2013 Course) (Semester - II) (502309)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) What is the purpose of independent suspension system? How is it achieved in front and rear axle? **[5]**

b) Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, G = 84 kN/mm2. Neglect the effect of stress concentration. Draw a fully dimensioned sketch of the spring, showing details of the finish of the end coils. **[5]**

Q2) a) Explain with the help of neat sketch centre point steering. **[5]**

b) What is true rolling? What is the condition to be satisfied by all types of steering mechanism for true rolling of a vehicle? **[5]**

Q3) a) Explain with the help of neat sketch self-energizing disc brakes. **[5]**

b) Write short note on ABS giving its advantages over normal braking system. **[5]**

Q4) a) What is run flat concept? What are the design features of run flat tyre? **[5]**

b) What are the advantages and disadvantages of Tubeless Tire with respect to conventional tires? **[5]**

P.T.O.

Q5) a) With the help of neat sketch explain suspension of rigid six wheelers. **[5]**

b) Write short notes on Scammell articulated trailer. **[5]**

Q6) a) Explain different types of brake shoe adjustments. **[5]**

b) What are the forces acting on rear / front tyres during different driving conditions? With the help of neat sketches, indicate the way these forces are transferred to various components of a car chassis. How these forces are affected by tyre pressure and road surface conditions. **[5]**

Q7) Write short notes on the following (Any two) **[10]**

a) Active suspension.

b) Tread design.

c) Types of tracks used for vehicle evaluation.

Total No. of Questions : 7]

SEAT No. :

P4079

[Total No. of Pages : 2

[5255]-577

M.E. (Mechanical) (Automotive Engineering)
VEHICLE DYNAMICS
(2013 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) ***All questions carry equal marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Draw the tire axis system as recommended by the SAE and explain various angles and forces associated with the tire. **[4]**

b) A passenger car weighing 15 kN is equipped with the radial-ply tires. The coefficient of rolling resistance of the tire is given by $fr = 0.0136 + 4 \times 10^{-8} V^2$, where V is the speed of vehicle in kmph. At a speed of 60 kmph, calculate

i) The power required to overcome rolling resistance of tire and

ii) the retardation rate of car due to rolling resistance of tire when brakes are applied. **[6]**

Q2) a) Discuss the effect of wheel lock up during braking on the directional stability and control of a road vehicle. **[2]**

b) The mass of a passenger car including four tires is 1500 kg. Each of the tires weighs 225 N, has an effective diameter of 67 cm and a radius of gyration of 28 cm. The engine develops a power of 45 kW at 4000 rpm. The equivalent weight of the rotating parts of the driveline is 450 N with a radius of gyration of 10 cm. The transmission efficiency is 88% and the total reduction ratio of the driveline in the second gear is 7.7 to 1. The vehicle has a frontal area of 1.67 m^2 and the aerodynamic drag coefficient is 0.45. Assume standard atmospheric temperature and pressure condition as 15°C and 1.013 bar and gas constant for air R = 287 J/kg-K. The average coefficient of rolling resistance is 0.015. Under these conditions determine **[8]**

i) Speed of the car,

ii) Aerodynamic resistance to the car and

iii) Acceleration of the car on a level road

P.T.O.

Q3) a) Define reference frame, toe-in, toe-out, wheel chamber, caster and kingpin angle with respective to the suspension kinematics. **[5]**

b) Explain roll center analysis of vehicle suspension. **[5]**

Q4) a) Write an expression for the steer angle required to negotiate a given curve in case of a two axel road vehicle and define the under-steer coefficient. Describe the various steady-state handling characteristics with the help of this coefficient. (No derivation). **[4]**

b) A passenger car weighs 20 kN and has a wheelbase of 2.8 m. The center of gravity is 1.27 m behind the front axle. If a pair of radial-ply tires, each of which has a cornering stiffness of 46 kN/rad are installed in the front, and a pair of bias-ply tires, each of which has a cornering stiffness of 33 kN/rad are installed in the rear. The average steering gear ratio is 22. Determine- **[6]**

i) Whether the vehicle is understeer or oversteer

ii) the required angle in degrees at steering wheel during a constant radius test with turn radius of 12 m at a constant forward speed of 40 kmph.

Q5) a) Discuss in detail the effect of natural frequency of sprung mass and damping factor on the performance of vehicle suspension. **[4]**

b) The sprung mass of a passenger car weigh 14 kN and the un-sprung parts weigh 8% of sprung mass. When car is stationary the suspension spring and tire deforms by 175 mm and 20mm respectively. **[6]**
Determine

i) Vertical stiffness of suspension spring and tire.

ii) The two natural frequencies of the bounce motion of the sprung and unsprung mass.

Q6) a) Explain the method of calculating RMS value of the vehicle response when it is excited by the random road profile with known power spectral density. **[5]**

b) Write short note on the model of ISO road profile. **[5]**

Q7) a) Explain the effect of wheelbase filtering on the vibration response of vehicle suspension to the road roughness. **[5]**

b) Explain various tests that can be used to evaluate handling characteristics of vehicles. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4080

[Total No. of Pages : 2

[5255]-578

M.E. (Mechanical) (Automotive Engineering)

AUTOTRONICS

(2013 Course) (Semester - III) (602314)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) Explain the role of Autotronics in luxury car w.r.t. application and advantages in fuel injection system, Electronic Brake Distribution, and Automotive air conditioning. **[10]**

Q2) Explain with a block diagram the overall computerized engine control system. **[10]**

Q3) Discuss in brief steering system requirements, Classification of steering systems, and Electric power assisted steering. **[10]**

Q4) Discuss the Objectives of Diagnostic Equipment, and role of Scan Tools, Breakout Boxes, Non-Powered Test Lights, Logic Probes, Digital Volt-Ohmmeters (DVOMs), Digital Storage Oscilloscopes (DSOs). **[10]**

Q5) a) Discuss the safety and comfort features of Airbag and Belt tensioners. **[05]**

b) Explain with a neat block diagram Multi Point Fuel Injection System. **[05]**

Q6) Explain with block diagram, working of Downstream, upstream, split & hybrid car air conditioners. **[10]**

P.T.O.

Q7) a) Explain electronic injection timing control in automobile engines. **[05]**

b) Explain Crank angle position sensor and throttle position sensor with important specifications. **[05]**

Q8) Discuss Vehicle Communication Networks, Multiplexing Communication Protocols, and Supplemental Data Bus Networks with application in modern automobiles. **[10]**

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Total No. of Questions : 5]

SEAT No. :

P4081

[Total No. of Pages : 2

[5255] - 579

M.E. (Mechanical) (CADME)

ADVANCED MACHINE DESIGN

(2013 Pattern) (502402) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt any two question from Q1, Q2 & Q3.***
2) ***Q4 and Q5 are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) The creep data at a certain temperature is obtained as **[8]**

S1 = 12 MPa $\in$ 1 = 0.012 percent per 1000 hrs.

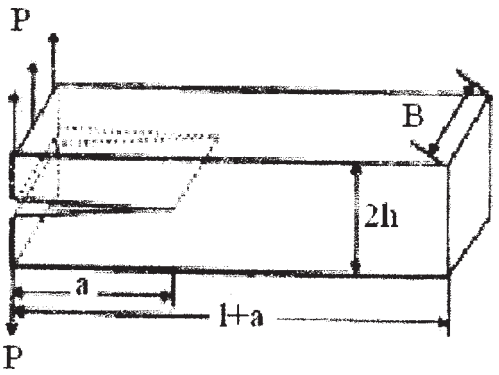
S2 = 15 MPa $\in$ 2 = 0.025 percent per 1000 hrs.

Determine the constants of hyperbolic sine law and calculate the creep rates of stress 35 MPa and 38 MPa.

b) Derive the expression for Airy's stress function in rectangular coordinate. **[7]**

Q2) a) Describe the Mechanism of creep of material at high temperature. **[7]**

b) Determine strain energy release rate for a double cantilever beam with a>>3h and l>>3h as shown in figure. The P is a applied load and B is the width of beam. **[8]**



P.T.O.

Q3) a) Explain the concept of energy balance during crack growth. **[7]**

b) Differentiate the standard gear tooth system with its application. **[8]**

Q4) Solve any two :

a) Derive the expression for maximum elastic strain theory. **[6]**

b) Explain the analytical details of loading and deflection of rubber springs used for simple shear load. **[4]**

c) Write short notes on relations between elastic constants. **[4]**

Q5) Solve any two :

a) A continuous and aligned glass fiber reinforced composites consist of 40% volume of glass fiber having modulus of elasticity 69 GPa and 60% volume of fiber polyster resin having modulus of elasticity of 3.4 GPa.**[6]**

i) Calculate modulus of elasticity of composite in longitudinal direction.

ii) If c/s area is 250 mm^2 and stress of 50 MPa is applied in longitudinal direction, determine the magnitude of load carried by each of fiber and matrix phase.

b) Explain the application of Raleigh-Ritz method with suitable example.**[4]**

c) Explain stress concentration around cut outs in composite laminates.**[4]**

Total No. of Questions :8]

SEAT No. :

P4082

[Total No. of Pages : 2

[5255]-580
M.E. (Mechanical) (CADME)
COMPUTER AIDED DESIGN
(2013 Pattern) (Semester - I) (502403)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Use of non programmable calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the CAD/CAM system evaluation criteria in brief. **[5]**

b) Explain with neat sketches the wire frame models. **[5]**

Q2) a) Explain the applications of the Bezier curves in design. **[5]**

b) Write notes on parametric representations of surface. **[5]**

Q3) Explain the Parametric representation of rules Surfaces with neat sketch and explain its need and applications. **[10]**

Q4) Explain Displaying, Segmentation, Trimming and Intersection used for surface manipulation. **[10]**

Q5) Explain the procedure to obtain orthographic views of solid object. **[10]**

Q6) a) Explain The IGES data structure. **[5]**

b) Write notes on surface removal algorithm. **[5]**

P.T.O.

Q7) a) Differentiate between conceptual design and top down design. **[5]**

b) Explain feature based modeling techniques and state its advantage over other. **[5]**

Q8) a) Explain the DXF file format used in CAD. **[5]**

b) Explain, how collaborative product design enhances the productivity. **[5]**

Total No. of Questions :7]

SEAT No. :

P4083

[Total No. of Pages :1

[5255] - 581

M.E. (Mechanical) (CADM & E)

COMPUTER INTEGRATED MANUFACTURING

(2013 Pattern) (Semester - II) (502407)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt any FIVE questions from following.***
2) ***Figures to the right indicate full marks.***

Q1) Explain design activities in a networked environment with suitable example. **[10]**

Q2) What is Group Technology? Explain its roll in integration of manufacturing processes. **[10]**

Q3) What is role of automated guided vehicles in the 'Flexible Manufacturing System'? Give an example from project based industry. **[10]**

Q4) What is CAD/CAM technology? Computer integrated manufacturing is natural evolution of CAD/CAM technology, justify. **[10]**

Q5) What are steps in integration of manufacturing to the web? Explain web based foundry process. **[10]**

Q6) Write steps in Computer Aided Process Planning. How is this achieved in Software enabled ERP system? **[10]**

Q7) a) What are characteristics of 'Lean manufacturing'? **[5]**

b) Explain Supply Chain Management in Auto Industry. **[5]**

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Total No. Of Questions :7]

SEAT No. :

[Total No. of Pages : 1

P4084 **[5255] - 582**

M.E. (Mechanical engg) (CADME)

INDUSTRIAL PRODUCT DESIGN & PRODUCT LIFECYCLE MANAGEMENT

(2013 Credit Pattern) (Semester-II)

Time : 3Hours] *[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) ***Assume suitable data if necessary.***

Q1) Explain the stages in product life cycle using diagram**.** **[10]**

Q2) Explain concurrent engineering in detail? Also explain house of quality with example? **[10]**

Q3) Explain the technologies used in understanding the customer needs with example. **[10]**

Q4) Explain product tear down method with example. **[10]**

Q5) Explain 6-3-5 method for concept generation with example, Also give advantages and disadvantages of it. **[10]**

Q6) What is prototype? Give its types with advantages and disadvantages.**[10]**

Q7) What is PLM strategy? Explain the concept with its importance. Discuss any four characteristics of PLM. **[10]**

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Total No. of Questions : 7]

SEAT No. :

P4085

[Total No. of Pages : 2

[5255]-583

M.E. (Mechanical) CADME

AUTOMATED MANUFACTURING SYSTEM MODELING

(2013 Pattern) (Semester - II) (502409)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Solve any 5 questions.***
2) ***Draw neat sketch if required.***
3) ***Use of calculator is allowed.***
4) ***Assume suitable data if required.***

Q1) a) Explain various plant layout configurations and explain with graph of product volume and variety? **[5]**

b) An automated material handling conveyor moves with speed of 20mt/ min with spacing between two work pieces as 0.5mt.It has reach of operator as 1.5mt. Let length of delivery loop is 2mt and that of return loop is 2.2mt. Then calculate following **[5]**

i) Feed Rate

ii) Tolerance time

iii) Loop travel time

iv) Number of pallets on conveyor

Q2) a) Explain types of Conveyors used in FMS with sketch? And also explain flexibility in material handling systems? **[5]**

b) Explain and sketch **[5]**

i) ASRS

ii) Robot cell with single machine server

P.T.O.

Q3) a) Explain Time Reversible Markov Chain and also Semi-Markov Processes in Manufacturing. **[5]**

b) Explain The M/M/1 Queue and M/M/m Queue with applications. **[5]**

Q4) a) Explain M/M/m queue model with state diagram? **[5]**

b) Explain Types of queuing networks with blocking mechanisms? **[5]**

Q5) a) Explain and sketch an automated assembly system in manufacturing cell? also explain the free transfer assembly line? **[5]**

b) Explain deadlock in AMS? Explain how deadlock can be avoided in 2-machine and 1-AGV used in AMS? **[5]**

Q6) A M/M/1/N server queue with two states 0 and 1, has $\lambda = 8$ parts /h and $\mu = 10$ parts /h then let $\dot{\rho} < 1$, so calculate following **[10]**

a) machine utilization

b) mean no of customers in system

c) mean no of customers in queue

d) mean waiting time in system and

e) mean waiting time in queue?

Q7) a) Explain classical and stochastic petrinets? Then state the applications of petrinet in manufacturing? **[5]**

b) Explain deadlock prevention and avoidance by petrinets in AMS? **[5]**

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Total No. of Questions : 7]

SEAT No. :

P4086

[Total No. of Pages : 1

[5255]-584

M.E. (Mech.) (CADME)

SIMULATION MODELING

(2012 Course) (Semester-III) (602413)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Use of non programmable calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the continuous and discrete systems. **[5]**

b) Explain the components of simulation systems. **[5]**

Q2) a) Explain in brief two server queue simulation with suitable example. **[5]**

b) Compare between Kolmogorov-Smirnov and chi-square test. **[5]**

Q3) Enlist different independence test and explain autocorrelation in detail. **[10]**

Q4) Differentiate between triangular and exponential distribution. **[10]**

Q5) Explain in detail empirical discrete distribution techniques. **[10]**

Q6) a) Explain the calibration and validation of simulation models. **[5]**

b) Write short note on output analysis for terminating simulation. **[5]**

Q7) Define modeling system randomness, sourses of randomness, and their effect on machine downtime. **[10]**

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Total No. of Questions : 7]

SEAT No. :

P4087

[Total No. of Pages : 1

[5255]-585

M.E. (Mechanical) (CADM&E)

OPTIMIZATION TECHNIQUES

(2013 Pattern) (Semester - III) (602414)

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) Solve by liner programming **[10]**

Minimize $f(x) = -67x_1 - 127x_2$

Subject to $37x_1 + 32x_2 \leq 4000$ where x_2 & x_1 is greater than or Equal to Zero.

Q2) How optimization problem can be formed? Explain sensitivity or post optimality analysis. **[10]**

Q3) Explain in detail Optimality Conditions for One Dimensional and Multi Dimensional Optimization. **[10]**

Q4) Discuss Exhaustive Search Method & Bounding phase method for bracketing. **[10]**

Q5) Solve using Powell Method, Minimize $F = X_1^2 + X_2^2 - 2X_1 - 4X_2 + 5$ **[10]**

Q6) Explain the concept of Simulated Annealing. **[10]**

Q7) Discuss feasible direction method & generalized reduced gradient method. **[10]**

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Total No. of Questions : 7]

SEAT No. :

P4088

[Total No. of Pages : 2

[5255]-586

M.E. (Mechanical - Mechatronics)

SYSTEM MODELLING IDENTIFICATION & SIMULATION

(2013 Course) (Semester - I) (502801)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) Determine the transfer function for the system in Fig Q1. **[10]**

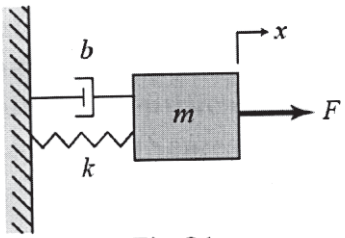

Fig Q1

Q2) Discuss the process of modelling of a cantilever beam using the distributed parameter approach. **[10]**

Q3) Derive the model of system in Fig Q2 using the bond graph approach. **[10]**

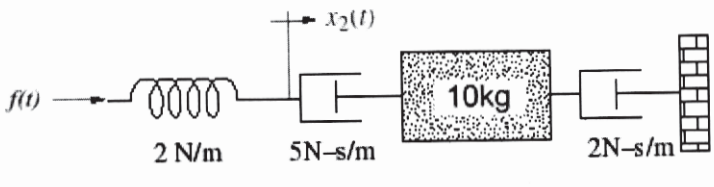

Fig Q2

P.T.O.

Q4) Using a suitable example discuss the criterion for selection of input signal during black box identification. **[10]**

Q5) Discuss in detail five exclusive points of differentiation between time domain and frequency domain approach for modelling of system. **[10]**

Q6) Draw a suitable flow chart and explain the working of Linear Kalman Filter. **[10]**

Q7) Using a suitable example discuss any one of the de-fuzzification techniques in detail. **[10]**

Total No. of Questions : 7]

SEAT No. :

P4089

[Total No. of Pages : 2

[5255] - 587

M.E. (Mechanical) (Mechatronics)

CONTROL SYSTEMS - I

(2013 Course) (502802) (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 Calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) Using a suitable example, explain closed loop control system. Also, list the advantages and disadvantages of closed loop control system. **[10]**

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -171 & -101.71\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u$$

$$y=\begin{bmatrix}1325 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+[0]u\ .$$

Eq. 1

Q2) For the system represented by Eq.(1), **[10]**

- Determine location of poles & zeros.
- Analyze the absolute stability of the system.
- Comment on the unit step response of the system.

Q3) With respected to full state feedback control, discuss the significance of the controllability and the observability aspects. **[10]**

Q4) For the system in Eq.1, design a full state feedback control system such that the said system has an overshoot of 10% and a 2% settling time of 1 second. **[10]**

P.T.O.

Q5) Draw a suitable block diagram and explain the operation of command tracking controller. **[10]**

Q6) Define condition number and discuss its significance with respect to the design of a control system. **[10]**

Q7) For the system in Eq. 1, design a full state observer system using the Ackermann's method. Assume the observer poles are located at $-40 \pm 54.6i$. **[10]**

Total No. of Questions :7]

SEAT No. :

P4090

[Total No. of Pages : 2

[5255]-588

M.E (Mechanical-Mechatronics)

SENSORS, TRANSDUCERS & INTERFACING TECHNIQUES

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Explain the various causes and types of experimental errors. State the different steps to reduce errors. **[5]**

b) Calculate mean, standard deviation & variance for the following data of length measurement.

length (cm) $\rightarrow$ 2.52, 2.47, 2.51, 2.09, 2.55, 2.43, 2.46, 2.48, 2.53, 2.48. comment on the result. **[5]**

Q2) a) Compare analog with digital instruments. Draw a neat block diagram of dual trace CRO & explain function of each block. state the different applications of CRO. **[5]**

b) State the basic principle of operation of LVDT. Using neat diagram explain operation of LVDT. **[5]**

Q3) a) State the different schemes of pressure measurement & explain any two in detail. **[5]**

b) Enlist the main features, advantages & drawbacks of following gauges-

i) Bridge man

ii) Knudsen

iii) Ionization. **[5]**

P.T.O.

Q4) a) State the different methods of flow measurement and explain any one in detail. **[5]**

b) Explain pressure probes with neat diagram. **[5]**

Q5) a) Discuss the technique of temperature measurement by electrical effects. **[5]**

b) Explain the following measurement techniques briefly

i) pH measurement

ii) Heat flux measurement. **[5]**

Q6) a) Explain the different types of strain gages. State advantages & drawbacks of each. **[5]**

b) Explain the concept of temperature compensation wrt strain measurement. **[5]**

Q7) a) State the various objectives of DAS. Explain the different types of DAS. Draw a neat block diagram two channel DAS & explain function of each block. **[5]**

b) What is need of A - to - D converters? State the different types of ADC's & explain any one in detail. **[5]**

Total No. of Questions :8]

SEAT No. :

P4091

[Total No. of Pages :3

[5255] - 589

M.E. (Mechanical) Mechatronics

PLC PROGRAMMING

(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 Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Following are the sequence of task or steps involved in simple press process shown in Figure *Q*l Draw the ladder logic diagram for the sequence given below. **[10]**

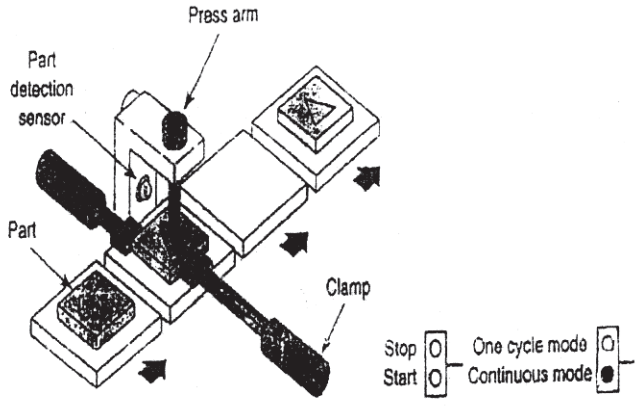

Figure Q1

a) The operator presses the start switch to start the machine or the stop switch to start the machine.

b) The machine checks for a part. If the part is present, the process continues. If not, the conveyor moves until a part is present.

c) The part is locked in place with clamp.

d) The press stamps the part.

P.T.O.

e) The clamp is unlocked and finished piece moved out of the press.

f) The process stops if the machine is in one cycle mode or continues if continuous mode is selected.

Q2) a) Explain the basic function of each of the three major parts of the CPU. **[5]**

b) State one application for each of the following special i/o module. **[5]**

i) Encoder counter module

ii) Stepper motor module

Q3) a) Outline the sequence of events involved in a single PLC program scan. **[5]**

b) How to the temporary end instruction used to troubleshoot a program. **[5]**

Q4) Draw the electrical symbol used to represent each of the following switches: **[10]**

a) NO pushbutton.

b) NC pushbutton.

c) Break - make push button.

d) Single - pole selector switch.

Q5) a) What information is stored in input and output tables? How is this information stored in memory? **[5]**

b) Explain the difference between the operation of a non-retentive timer and that of retentive timer. **[5]**

Q6) Draw the ladder diagram for PLC is monitoring five tanks (A, B, C, D & E) of liquid and must give a warning to operator when three of them are empty. It doesn't matter which three tanks are empty, only that any three of the five are empty. **[10]**

Q7) a) What two addresses are contained in some five-digit PLC addressing formats? **[5]**

b) Describe two common applications for counters. **[5]**

Q8) Prepare a ladder diagram for automatic mixing process in industry from the description given below. (Refer Fig *Q*8) **[10]**

a) Open valve VAl until level is reached LS2 for first liquid.

b) Close valve VA1.

c) Open valve VA2 until level is reached to LS1 is reached for second liquid.

d) Close valve VA2.

e) Start the agitator Motor with Stirrer for 1 minute and stop.

f) Open valve VA3 for 2 minutes to empty the mixed liquid.

g) Repeat (a) to (g) or end the process as per requirement.

VA1, V A2 Input Valves, VA3 Output Valves, LS1, LS2 Level Switches.

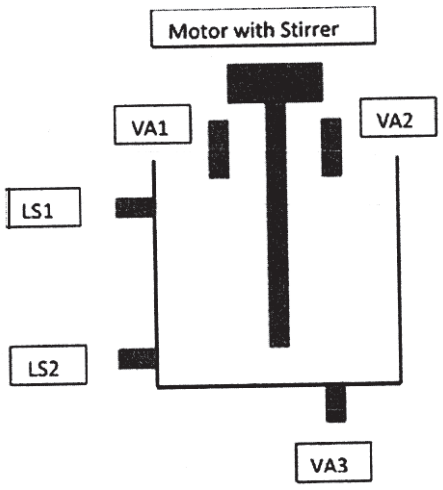

Fig Q8

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Total No. of Questions : 7]

SEAT No. :

P4092

[Total No. of Pages : 1

[5255] - 590
M.E. (Mechanical - Mechatronics)
CONTROL SYSTEMS - II
(Semester - II) (2013 Course) (502808)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) Using a suitable example discuss the process of identification of a time domain model. **[10]**

Q2) Draw the root locus for the system in Eq. (1) and comment on its stability. **[10]**

$$TF = \frac{1}{(s+1)(s+2)(s+3)}$$

Q3) Draw a suitable block diagram and derive the transfer function for PID control in parallel form and the equation for control signal for the said controller. **[10]**

Q4) Define actuator windup, discuss its consequences and describe technique to overcome the effect of actuator windup. **[10]**

Q5) Using the CHR step response method determine the gains as well as the transfer function of the PID control in parallel form. Assume a = 0.218 and L = 0.806. **[10]**

Q6) Draw a suitable block diagram and explain the operation of Kappa Tau Controller tuning technique using a suitable example. **[10]**

Q7) Using a suitable example discuss the loop shaping technique for designing of controller in frequency domain. **[10]**

✦ ✦ ✦

Total No. of Questions : 8]

SEAT No. :

P4093

[Total No. of Pages : 2

[5255]-591

M.E. Mechanical (Mechatronics)

INDUSTRIAL DRIVES AND ACTUATORS

(2013 Course) (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 indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Discuss the working of variable voltage, supply frequency Induction motor drive. **[10]**

Q2) Discuss the advantages and disadvantages of AC and DC drives. **[10]**

Q3) a) Compare Hydraulics and Pneumatics on the basis of cost, precision and applications. **[5]**

b) Discuss in brief with hydraulic circuit symbols, Unloading valve, and hydraulic motor. **[5]**

Q4) Explain forward motoring and braking, reverse motoring and braking operation modes of DC drive. **[10]**

Q5) a) With respect to Construction, working and specific applications, discuss Gear pump used in industrial hydraulics. **[5]**

b) Draw symbols in hydraulic circuits used to represent Counterbalance valve with working. **[5]**

P.T.O.

Q6) a) Derive torque equation of three phase synchronous motor in terms of load angle. **[6]**

b) Explain construction and working principle synchronous motor. **[4]**

Q7) Discuss in brief the meter in and meter out circuits with applications. **[10]**

Q8) Answer any two: **[10]**

a) Selection of Electric Drives.

b) Center positions of Direction Control Valve.

c) Classification of Load torque.

x x x

Total No. of Questions : 8]

SEAT No. :

P4094

[Total No. of Pages : 2

[5255]-592

M.E. (Mechatronics) (Mechanical)

MICROCONTROLLER APPLICATIONS IN EMBEDDED SYSTEMS

(2013 Course) (Semester-III) (602813)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data wherever necessary.***

Q1) a) Explain with neat diagram support devices of PIC18F microcontroller. **[4]**

b) Draw block diagram of PIC18F microcontroller. Explain Program memory and data memory in detail. **[4]**

c) Enlist instructions used for logical operation in PIC18F microcontroller. **[2]**

Q2) a) Draw and Explain programming model of PIC18F microcontroller? **[4]**

b) Explain in brief the instructions used for Logical operation, branch and call operation for PIC 18F microcontroller. **[4]**

c) Explain with example instruction format for Bit-Oriented operations. **[2]**

Q3) a) Explain in detail interfacing of LED in PIC 18 microcontroller. **[4]**

b) What is basic concepts in I/O Interfacing explain with Block diagram. **[4]**

c) What is Subroutine? **[2]**

Q4) a) Draw and explain with block diagram Timer0 of PIC18F in 16-bit Mode. **[4]**

b) Explain in detail different interrupts used in PIC18 Microcontroller. **[4]**

c) List out Timers used in PIC18F microcontroller. **[2]**

P.T.O.

Q5) a) Write a note on Serial Peripheral Interface (SPI) with applications. **[4]**

b) Explain in detail PIC18F A/D Converter module. **[4]**

c) What are different A-to-D conversion methods. **[2]**

Q6) a) Explain in detail all the features of embedded systems. **[4]**

b) Explain Hardware aspect of the Time and Temperature Monitoring System (TTMS). **[4]**

c) Enlist applications of embedded systems. **[2]**

Q7) a) Explain in detail interfacing of Push-Button keys. **[5]**

b) List and Explain the instructions used for Arihmetic operation and logical operation for PIC18F microcontroller. **[5]**

Q8) a) Explain basic concepts in serial communication. **[5]**

b) Explain basic concepts in counters and timers with their features and applications of timer. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4095

[Total No. of Pages : 2

[5255]-593

M.E. (Mechanical) (Mechatronics)

FLEXIBLE MANUFACTURING SYSTEMS

(2013 Course) (Semester - III) (602814)

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 electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary and mention it clearly.***

Q1) a) Classify the production machines in terms of worker participation. **[5]**

b) Why are continuous work transport systems uncommon on automated production lines. **[5]**

Q2) Explain the Largest candidate rule line balancing algorithm with suitable example. **[10]**

Q3) a) State the reasons for including storage buffer in an automated production line. **[5]**

b) Explain why automated assembly system is required and mention few examples of actual products manufactured using such. **[5]**

Q4) a) Explain the features of part classification & coding systems. **[3]**

b) Four machine are used to produce a family of parts are to be arranged into a GT cell. The From/To data for parts processed by machines are shown in table. **[7]**

i) Determine the most logical sequence of machines for this data.

ii) Construct the network diagram for data, showing where and how many parts enter and exit the system.

P.T.O.

iii) Compute the percentage of in-sequence moves, bypassing moves, and backtracking moves in the solution.

iv) Develops a feasible layout plan for the cell.

	To			
From	1	2	3	4
1	0	10	0	40
2	0	0	0	0
3	50	0	0	20
4	0	50	0	0

Q5) Define FMS and explain FMS planning & implementation issues. **[10]**

Q6) a) Explain role of P-chart and C-chart in Quality Control. **[5]**

b) Explain how control charts are used as a feedback system in statistical process control. **[5]**

Q7) Explain the functions and components of vision systems with the help of block diagram. **[10]**

Q8) a) Write short note on MRP. **[5]**

b) Write short note on capacity planning. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4096

[Total No. of Pages : 2

[5255] - 594

M.E. (Mechanical) (Energy Engineering)

ADVANCED THERMODYNAMICS

(2013 Course) (Semester - I) (502502)

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 are allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) What is the law of corresponding states? **[5]**

b) Consider a gas mixture that consists of 5 kg of O_2, 8 kg of N_2 and 16 kg of C_8H_{18}. Determine : **[5]**

i) the mass fraction of each component,

ii) the mole fraction of each component and

iii) the average molar mass and gas constant of the mixture.

Q2) a) Write short note on the steam table and its uses. **[4]**

b) A vessel of volume 0.05 m^3 contains a mixture of saturated water and saturated steam at a temperature of 240ºC. The mass of the liquid present is 10 kg. Find the pressure, the mass, the specific volume, the enthalpy, the entropy and the internal energy. **[6]**

Q3) a) What do you understand by entropy transfer? Why is entropy transfer associated with heat transfer and not with work transfer? **[5]**

b) At S.T.P., 8.5 litres of oxygen and 15 litres of hydrogen mix with each other completely in an insulated chamber. Calculate the entropy change for the process assuming both gases behave as ideal gases. **[5]**

P.T.O.

Q4) a) Write note on Energy Destruction. **[4]**

b) Two kg of air at 450 kPa, 90ºC expands adiabatically in a closed system until its volume is doubled and its temperature becomes equal to that of the surrounding which is at 101 kPa, 15ºC. For this process, determine

i) The maximum work

ii) The change in availability.

iii) The irreversibility.

For air, take c_v = 0.718 kJ/kg K, u = c_vT where c_v is constant and pV = mRT where p is pressure in kPa, V volume in m^3, m mass in kg, R a constant equal to 0.287 kJ/kg K, and T temperature in K. **[6]**

Q5) a) Write short note on Joule Thomson coefficient. **[4]**

b) With usual notations derive the following thermodynamic relation.

$$C_p - C_v = \frac{TV\beta^2}{k_T}.$$ **[6]**

Q6) a) What is fugacity and activity? **[5]**

b) The products of combustion of an unknown hydrocarbon C_xH_y have the following measured composition : **[5]**

10% CO_2, 0.9% CO, 8.8% O_2 and 80.3% N_2.

Determine the composition of the fuel, air fuel ratio and percentage excess air used.

Q7) a) Describe the anomalous behaviour of water compared to other liquids. **[5]**

b) A certain gas has C_p = 1.2 and C_V = 1.5 kJ/kg K. Find its molecular weight and the gas constant.

A constant volume chamber of 0.3 m^3 capacity contains 2 kg of this gas at 5ºC. Heat is transferred to gas until the temperature is 100ºC. Find the work done, the heat transferred and the changes in internal energy, enthalpy and entropy. **[5]**

Q8) a) Write a note on T-dS relations. **[5]**

b) Explain Inversion Curve and Joule - Thompson Coefficient. **[5]**

Total No. of Questions :8]

SEAT No. :

P4097

[Total No. of Pages :4

[5255] - 595

M.E. (Mechanical - Energy Engineering)

ADVANCED HEAT TRANSFER

(2013 Pattern) (Semester - II) (502107)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) Explain the following terms: **[10]**

a) Lumped capacitance

b) Thermal diffusivity

c) Thermal Contact Resistance.

d) Overall Heat Transfer Coefficient.

e) Variable Thermal Conductivity.

Q2) a) An Aluminium sphere weighing 5.5 kg and initially at a temperature of 290ºC is suddenly immersed in a fluid at l5ºC. The convective heat transfer coefficient is 58W/m^2K. Estimate the time required to cool the Aluminium to 95ºC, using the lumped capacity method of analysis. **[7]**

b) Define and explain significance of Biot Number. **[3]**

Q3) a) Explain velocity and thermal boundary layer. **[5]**

b) Write a note on Dimensionless numbers in Convection. **[5]**

P.T.O.

Q4) a) Air at 30ºC is flowing across a tube with a velocity of 25 m/s . The tube could be either a square with side 5cm or a circular cylinder of diameter 5 cm. The tube surface temperature is 124ºC. Compare the rates of heat flow in each case. **[8]**

Use $NuD = 0.027Re_D^{0.805} Pr^{0.33}$ for circular tube

$NuD = 0.102Re_D^{0.675} Pr^{0.33}$ for square tube

b) Explain the significance of Nusselt Number. **[2]**

Q5) In a staggered tube bank, water is passed through the tubes while the air is passed in cross flow over the tubes. There are seven rows of tubes in the air flow direction. The temperature and velocity of air are 15ºC and 6 m/s respectively. The longitudinal and transverse pitches are both equal to 20.5 mm. The tube outside diameter is 16.4 mm and the tube surface temperature is 70ºC. Calculate the air side heat transfer coefficient and the pressure drop across the tube bundle. **[10]**

Q6) a) Using dimensional analysis establish a relation between Nusselt, Prandtl and Grash of numbers. **[5]**

b) A metal in got, 5cm by 8cm by l2cm, at a temperature of 50ºC, is losing heat by natural convection to air at 0ºC. The vertical dimension is 12cm calculate the coefficient of heat transfer.

Take Properties of Air – $\beta = 1/300\ K^{-1}$ $\upsilon = 15.89 \times 10^{-6}\ m^2/s$

$K = 26.3 \times 10^{-3}$ W/mK $Pr = 0.707$

Q7) a) Explain filmwise and dropwise condensation. **[6]**

b) There is cylindrical projection of Diameter D and height H on a large plane surface. Find the shape factor of the projecting surface (top plate surface + curved cylindrical surface) W.r.t. to the plane surface. **[4]**

Q8) Net radiation from the surfaces of the two large plates maintained at a temperature of 73ºC and 23ºC is to be reduced by 105 times. Calculate the number of radiation screens to be placed between them to achieve this effect. Assume that the emissivity of screen, $\varepsilon_s = 0.05$ and that of surface $\varepsilon_1 = \varepsilon_2 = 0.8$. After this if one of the screen is removed how many times the net radiation be reduced?

Table: Properties of Air

Temperature (ºC)	ν (m^2/s)	K (W/mK)	Pr	ρ (Kg/m^3)
42.5	17.4×10^{-6}	2.74×10^{-2}	0.705	1.217
77	20.92×10^{-6}	3×10^{-2}	0.7	1.217

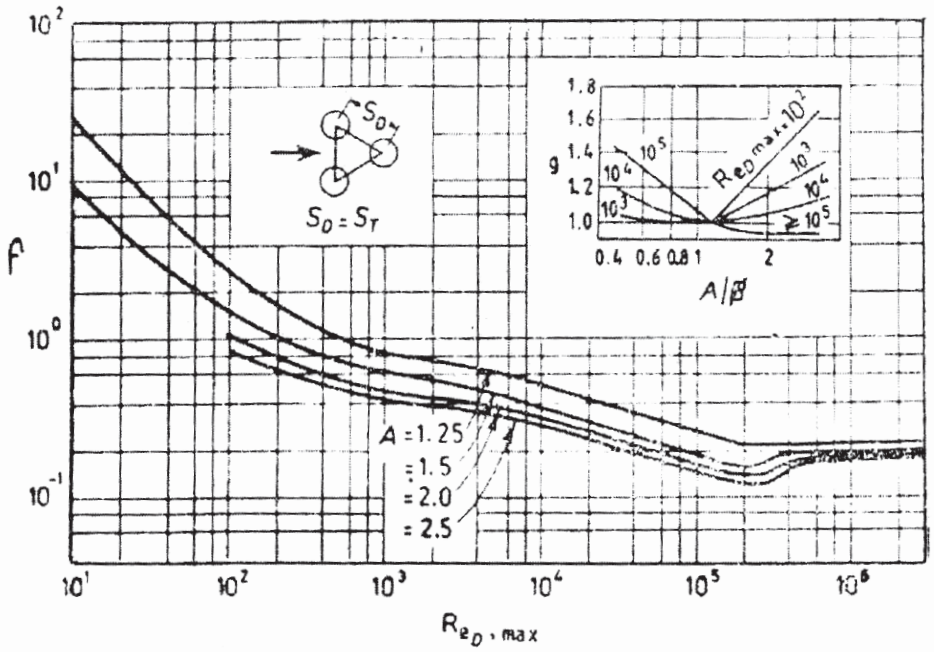

Fig. 7.10 Friction Factor, *f*, and Correction Factor, *g*, for Eq. (7.79) for Staggered Tube Bank Arrangement.

Table 7.5 Correction factor C_2 of Eq. (7.77)

N	1	2	3	4	5	6	7	8	9
In Line	0.64	0.80	0.87	0.90	0.92	0.94	0.96	0.98	0.99
Staggered	0.68	0.75	0.83	0.89	0.92	0.95	0.97	0.98	0.99

Table 7.4 Constants C_1 and n of Eqs. (7.75) and (7.76)

Arrangement	$\frac{S_L}{D}$	$S_{T/D}$ 1.25		1.50		2.0		3.0	
		C_1	n	C_1	n	C_1	n	C_1	n
In-line	1.25	0.348	0.592	0.275	0.608	0.100	0.704	0.0633	0.752
	1.50	0.367	0.586	0.250	0.620	0.101	0.702	0.0678	0.744
	2.0	0.418	0.570	0.299	0.602	0.229	0.632	0.198	0.648
	3.0	0.290	0.601	0.357	0.584	0.374	0.581	0.286	0.608
Staggered	0.6	—	—	—	—	—	—	0.213	0.636
	0.9	—	—	—	—	0.446	0.571	0.401	0.581
	1.0	—	—	0.497	0.558	—	—	—	—
	1.125	—	—	—	—	0.478	0.565	0.518	0.560
	1.250	0.518	0.556	0.505	0.554	0.519	0.556	0.522	0.562
	1.500	0.451	0.568	0.460	0.562	0.452	0.568	0.488	0.568
	2.0	0.404	0.572	0.416	0.568	0.482	0.556	0.449	0.570
	3.0	0.310	0.592	0.356	0.580	0.440	0.562	0.428	0.574

Total No. of Questions :8]

P4098

SEAT No. :

[Total No. of Pages : 2

[5255] - 596

M.E. (Mechanical - Energy Engg.)

ENERGY CONVERSION SYSTEMS

(2013 Course) (Semester - II) (502508)

Time : 3Hours] *[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 Proximate and Ultimate analysis of coal. **[6]**

b) Explain renewable and non-renewable 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 =75cm, R.P.M. = 3500, Stream velocity at exit of the blades 170 m/s, Blade outlet angle=20^{o}, Steam flow through blades = 8 kg/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) What do you understand by energy efficiency related to refrigeration plant. **[4]**

b) Explain centrifugal and reciprocating compressors with neat sketch used in refrigeration system. **[6]**

P.T.O.

Q4) a) Explain the operating principle of a waste heat recovery boiler with examples. **[5]**

b) Explain heat pump with neat sketch. **[5]**

Q5) a) Explain suitability of compressor for different applications. **[5]**

b) Define various components of the compressed air system. **[5]**

Q6) a) Explain advantages and disadvantages of Diesel power plants. **[4]**

b) Explain Energy Saving opportunities in Cooling Towers. **[6]**

Q7) Explain in detail Reheat and intercooling methods for improvement of the efficiency of gas turbine power plant with cycle analysis. **[10]**

Q8) write a short note on the following**.** **[10]**

a) Impulse Turbines.

b) Reaction Turbine.

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Total No. of Questions : 8]

SEAT No. :

P4099

[Total No. of Pages : 2

[5255]-597

M.E. (Mechanical Engineering) (Energy Engg.)
ENERGY MANAGEMENT
(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instruction 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, in necessary.***

Q1) a) Explain the Importance and Scope of Energy Management System. **[5]**

b) Explain the various types of sources of energy in world energy market. **[5]**

Q2) a) Discuss the types of Energy Audit briefly. **[5]**

b) What are the managerial functions involved in Energy Management. **[5]**

Q3) a) Explain the common insulating materials of thermal insulation. **[5]**

b) Explain any one method of condensate heat recovery. **[5]**

Q4) a) What are the types of lamps used in lighting system? Write down their features with typical applications. **[5]**

b) List the losses in induction motors and their expected percentage out of the total losses. **[5]**

Q5) a) Give details on the working principle of Recuperators with neat diagram. **[5]**

b) What are the topping and bottoming cycles of Co-generation? **[5]**

P.T.O.

Q6) a) Classify the Radioactive waste. **[5]**

b) Explain Regulation and Policy issue of Nuclear Waste Management. **[5]**

Q7) a) What is steam trap? List various types of steam traps. **[5]**

b) Explain the phenomenon of surge with sketch in a centrifugal compressor. **[5]**

Q8) Write a short note on (any two): **[10]**

a) Heat Pump.

b) Demand Side Management.

c) Condensate Heat Recovery.

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Total No. of Questions : 8]

SEAT No. :

P4100

[Total No. of Pages : 2

[5255]-598

M.E. (Mechanical) (Energy Engineering)
NUCLEAR MATERIALS AND REACTOR FUNDAMENTALS
(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 side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) What are the different considerations for the material selection of Nuclear Materials? **[6]**

b) Explain the effect of nuclear radiation on mechanical and corrosion properties of nuclear grade stainless steel? **[4]**

Q2) a) Explain the hardening and embrittlement of nuclear materials due to exposure of nuclear radiations. **[5]**

b) With the help of neat diagram. explain the dislocation theory? **[5]**

Q3) a) Describe the following scattering interaction between a neutron and a nucleus: **[5]**

i) Elastic scattering

ii) Inelastic Scattering

b) Describe the curve of Binding Energy per Nucleon versus mass number and give a qualitative description of the reasons for its shape. **[5]**

P.T.O.

Q4) a) Compare the merits and demerits of BWR and PWR. **[5]**

b) Define the following terms: **[5]**

i) Fissile material.

ii) Fissionable material.

iii) Fertile material.

Q5) a) Explain the moderators used in the nuclear reactors. **[5]**

b) What is In-situ leaching? Explain in detail. **[5]**

Q6) a) Explain the following processes of nuclear fuel enrichment. **[5]**

i) Gaseous diffusion,

ii) Centrifuge diffusion

b) Why U^{235} fissions with thermal neutrons and U^{238} fissions only with fast neutrons? Explain. **[5]**

Q7) a) Define and explain the following terms: **[6]**

i) Enriched uranium.

ii) Depleted uranium.

b) What are nuclear radiation and their impact on environment? **[4]**

Q8) Write a note on: **[10]**

a) Nuclear waste disposal.

b) Types of Nuclear reaction.

c) Neutron capture.

Total No. of Questions : 8]

SEAT No. :

P4101

[Total No. of Pages : 2

[5255]-599

M.E. (Mechanical) (Energy Engineering)

ENERGY SYSTEMS MODELING & ANALYSIS

(2013 Course) (Semester - III) (602514)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Explain the types of the system study. **[5]**

b) What is a system? Explain the concept of system and system environment with an example? **[5]**

Q2) a) Write note on necessity of system modeling. **[4]**

b) What are different types of model? Explain Mathematical model. **[6]**

Q3) a) Explain various types of simulation models for system study. **[6]**

b) Compare the simulation and analytical methods. **[4]**

Q4) Explain with an example, the simulation procedure for analyzing a system. **[10]**

Q5) a) The flow rate Q(m^3/s) in circular pipes is measured as a function of the diameter D and the pressure difference Δp. Obtain a best fit for data given in table, assuming a power-law dependence of Q on the two independent variables D and Δp. **[6]**

P.T.O.

D(m)	0.3	0.5	1.0	1.4
Δp(atm)				
0.5	0.13	0.43	2.1	4.55
0.9	0.25	0.81	4.0	8.69
1.2	0.34	1.12	5.5	11.92
1.8	0.54	1.74	8.59	18.63

b) Explain different steps in simulation study. **[4]**

Q6) Use the Simplex method to find the maximum value of: **[10]**

$z = 3x_1 + 2x_2 + x_3$

Subject to the constraints

$$4x_1 + x_2 + x_3 = 30$$
$$2x_1 + 3x_2 + x_3 \leq 60$$
$$x_1 + 2x_2 + 3x_3 \leq 40$$

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

Q7) a) Minimize the function $f(x) = 0.65 - [0.75/(1 + x^2)] - 0.65x \tan^{-1}(1/x)$; in the interval [0,3] by the Fibonacci method using n = 6. Also find reduction ratio. **[5]**

b) Explain Fibonacci search technique and write its algorithm to find optimum design. **[5]**

Q8) For what purpose Lagrange multiplier method is used? Write the proof of Lagrange multiplier method. **[10]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

P4102

[Total No. of Pages : 3

[5255]-600

M.E. (Electronics) (Digital System)
MICROELECTRONICS
(2013 Pattern) (Semester - I) (504101)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***All questions carry equal marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of Calculator is allowed.***

Q1) a) Explain MOS I-V characteristics also give the drain current equation for MOS transistor. **[5]**

b) What is pass transistor logic? Give an expression for the output voltage for the pass transistor networks shown in Figure 1. Neglect the body effect. **[5]**

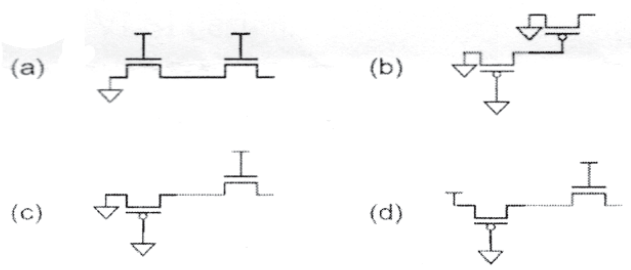

Figure 1

Q2) a) Suppose V_{DD} = 1.2 V and V_t = 0.4 V. Determine V_{out} in Figure 2 for the following. Neglect the body effect. **[4]**

i) V_{in} = 0 V, ii) V_{in} = 0.6 V,

iii) V_{in} = 0.9 V, iv) V_{in} = 1.2 V.

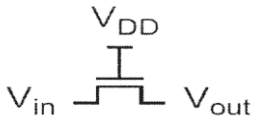

Figure 2

P.T.O.

b) Draw and explain the CMOS inverter characteristic. What is effect of $\frac{\beta_n}{\beta_p}$ ratio on characteristic. **[4]**

c) Draw the circuit of tristate inverter also explain the working? **[2]**

Q3) a) What are n-well, p-well and twin tub process? Explain fabrication steps of CMOS inverter with twin tub process. **[5]**

b) Draw the CMOS circuit, stick diagram and layout for (i) NAND gate (ii) OR gate? **[5]**

Q4) a) Consider the design of a CMOS compound gate computing **[4]**

$$F = \overline{(AB) + (CD)}$$

i) sketch a transistor - level schematic

ii) sketch a stick diagram

iii) estimate the area from the stick diagram

b) What are the different steps involved in Gate and Source/Drain fabrication? **[4]**

c) What is layout design rule? **[2]**

Q5) a) Explain Elmore Delay Model. **[4]**

b) What are the different power dissipations in CMOS circuits? Explain short circuit power dissipation. **[4]**

c) What is Design Margin. **[2]**

Q6) a) What is low power VLSI design. **[4]**

b) Compare CMOS and BiCMOS technologies with respect to speed, noise margin, power dissipation and input impedance. **[4]**

c) Calculate the approximate power dissipation in a chip operating with V_{dd} = 1.2 V at 200 MHz with an internal switched capacitance of 100 pF. **[2]**

Q7) a) What is current mirror circuit? Draw the basic current mirror circuit and explain the working. **[4]**

b) Design a Half adder using **[4]**

i) Static CMOS logic

ii) Pass transistor logic

iii) Pseudo NMOS logic

iv) Dynamic CMOS logic

c) Draw the MOS small signal Model and explain. **[2]**

Q8) a) Sketch transistor level schematic for a single stage CMOS logic gate for each of the following function. **[4]**

i) $Y = \overline{AB+C}$

ii) $Y = \overline{(A+B)\cdot C}$

iii) $Y = \overline{ABC+DE}$

iv) XOR Gate

b) Write short notes (any two): **[4]**

i) Channel length modulation

ii) Psuedo-nMOS logic

iii) Bi CMOS Circuit

c) How CMOS inverter can be used as amplifier. **[2]**

Total No. of Questions : 8]

SEAT No. :

P4103

[Total No. of Pages : 2

[5255]-601

M.E. (Electronics) (Digital Systems)
DIGITAL SIGNAL PROCESSING ARCHITECTURES
(2013 Course) (Semester-I) (504102)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions out of eight questions.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***
4) ***Use of scientific calculator is allowed.***

Q1) a) What is DCT? Explain any two properties of DCT. **[4]**

b) Explain in detail DTMF generation & detection. Explain Goertzel algorithm. **[6]**

Q2) a) Compute eight point FFT for x(n) = {1 2 2 1 1 2 1 1} using decimation in frequency FFT algorithm. **[6]**

b) Explain IIR filter design using Bilinear Transformation method. **[4]**

Q3) a) Explain DIF FFT radix2 algorithm with mathematical expressions. Draw butterfly diagram for same. **[6]**

b) What do you mean by Gibb's phenomenon? What is the cause of Gibb's phenomenon? **[4]**

Q4) a) Using frequency sampling method design a band pass filter with the following specification: **[8]**

i) Sampling frequency = 8000 Hz

ii) Cut of frequency fcl = 1000 Hz, fc2 = 3000 Hz

Determine the filter coefficients for N = 7.

b) Define: **[2]**

i) Decimation ii) Interpolation

P.T.O.

Q5) Write shorts notes on: **[10]**

a) Black Fin processor

b) STFT

Q6) Design 11 coefficient FIR LPF using frequency sampling method with cut-off frequency $2F_s/11$ where F_s is sampling frequency. Plot the magnitude response of the resulting filter. **[10]**

Q7) a) What is need of antialiasing filter prior to down sampling and anti-imaging filter after up sampling a signal? **[4]**

b) Explain the addressing modes of TMS 320C54XX with examples. **[6]**

Q8) a) Draw & Explain architecture of TMS 320C67XX. **[6]**

b) Explain barrel shifter with block schematic. **[4]**

Total No. of Questions :8]

SEAT No. :

P4104

[Total No. of Pages :2

[5255] - 602

M.E. (Electronics) (Digital Systems)

EMBEDDED SYSTEM DESIGN

(2013 Credit Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answers any one Question out of Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6, Q. No.7 or 8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non programmable electronics pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) What is difference between embedded system and desktop (PC/Laptop) system. **[6]**

b) Compare the functional model with architectural model of an embedded system. **[6]**

OR

Q2) a) Compare Water fall with spiral model of software design. **[6]**

b) Explain design metrics with respect to mobile as embedded system. **[6]**

Q3) a) Compare ARM9 and ARM7 architecture. **[8]**

b) Explain how ARM 9 architecture support higher language programming. **[6]**

OR

Q4) a) What are load and store instruction in ARM processor. **[6]**

b) Draw and explain architecture of ARM9 processor. **[8]**

P.T.O.

Q5) a) What are the different steps to implement boot loader in embedded system. **[6]**

b) Explain development tools for embedded linux. **[6]**

OR

Q6) a) Compare ext2 and ext3 files used in Embedded Linux. **[6]**

b) Write algorithm of loadable device driver for "Hello Word" program. **[6]**

Q7) a) Explain in brief the architecture of Android OS. **[6]**

b) Explain various network service support provided by Android OS. **[6]**

OR

Q8) a) Write a short note on Android telephony. **[6]**

b) What are the main features of Android OS. **[6]**

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Total No. of Questions : 10]

SEAT No. :

P4105

[Total No. of Pages :3

[5255] - 603

M.E. (Electronics /All E & TC) (Digital Systems)

RESEARCH METHODOLOGY

(2013 Credit Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Right side figure indicate marks.***
2) ***Solve Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8, Q.9 OR Q.10.***

Q1) a) What is research? Describe the Scientific way of doing the Research? **[5]**

b) Describe the role of data collection in research? Explain data collection using digital computer systems? **[5]**

OR

Q2) a) How to define Scope and Objective of research problem? **[5]**

b) What are the different characteristics of instruments? Explain each with suitable example? **[5]**

Q3) a) Write a brief note on different types of techniques of data analysis & pointing out the significance of each. **[6]**

b) Explain role of Principal Component Analysis (PCA) in research? **[4]**

OR

Q4) a) What is State Vector Machines (SVM)? How it is useful in research? **[5]**

b) Discuss the important of mathematical models in Engineering Research study. **[5]**

P.T.O.

Q5) a) Explain nonlinear analysis and asymptotic analysis of systems? **[5]**

b) Explain parameter to be considered in preparing prediction model for experimental setup. **[5]**

OR

Q6) a) Explain sensitivity theory and applications in modeling and prediction and performance analysis. **[5]**

b) Explain multiscale modeling of process system? How to verify its performance? **[5]**

Q7) a) Explain role of probability study in research? **[3]**

b) The following data are expected to follow a linear relationship of the form $y = ax+b$. Obtain the best linear relation in accordance with a least square analysis. Calculate standard deviation of the data from the result.**[7]**

x	0.9	2.3	3.3	4.5	5.7	6.7
y	1.1	1.6	2.6	3.2	4.0	5.0

OR

Q8) a) The following 10 observations were recorded when measuring voltage 41.7, 42.0, 41.8, 42.0, 42.1, 41.9, 42.0, 41.9, 42.5 and 41.8 V find **[6]**

i) Mean.

ii) Standard Deviation.

iii) Variance.

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

i) Confidence interval

ii) Confidence level

iii) Confidence interval of mean

Q9) a) Describe, in brief, the layout of a research report, covering all relevant points. **[5]**

b) Write a short note on 'Documentation' in the context of a research report. **[5]**

OR

Q10)a) What points will you keep in mind while preparing a research report? Explain. **[5]**

b) What are the different forms in which a research work may be reported. Describe. **[5]**

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Total No. of Questions :8]

SEAT No. :

P4106

[Total No. of Pages : 2

[5255]-604
M.E. (Electronics) (Digital Systems)
DESIGN FOR TESTABILITY
(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Show how the function f (w_1, w_2, w_3) = can be implemented using a 3 to 8 binary decoder and an OR gate.

b) Implement f (w_1, w_2, w_3) = Σm (0, 4, 6, 7) using 2:1 multiplexer, use Shanon's expansion similarly use 4:1 Mux for the same.

Q2) a) What is meant by design for testability? What are the characteristics of DFT.

b) 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.

Q3) a) An SR flip-flop is a flip-flop that has set and reset inputs like a gated SR latch show how an SR flip-flop can be constructed using a D flip-flop and other logic gates.

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.

Q4) a) Consider the Function f=(w_1,w_2,w_3,w_4)=m(0,1,3,6,8,9,14,15) Derive a circuit that implements f using the minimal number of three input LUTs.

b) Write VHDL code to expand 8-to-1 multiplexer using component 2-to-1 multiplexer.

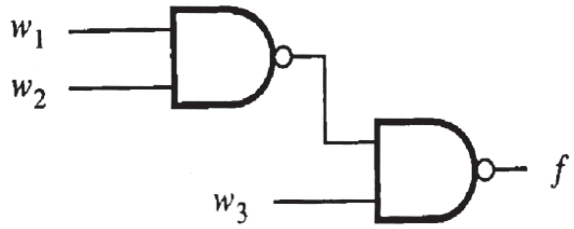
P.T.O.

Q5) a) Show how a JK flip -flop can be constructed using a T flip flop and other logic gates.

b) Explain the BIST architecture for sequential circuit.

Q6) a) Explain the significance of enable input in digital circuits with example.

b) 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.



Q7) a) Consider the function Use the truth table to derive a circuit that uses 2-to-1 multiplexer.

b) Explain the steps involved in Scan Path Technique.

Q8) a) Explain what are static and dynamic hazard.

b) Explain control path and data path in ASM chart.

Total No. of Questions : 8]

SEAT No. :

P4107

[Total No. of Pages : 2

[5255]-605

M.E. (Electronics - Digital Systems)

PLD'S AND ASIC DESIGN

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Solve any 5 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) What are the different examinations are carried out in the static timing analysis. **[4]**

b) Explain the state diagram optimization. **[4]**

c) What are data path and control path? **[2]**

Q2) a) Explain the architecture and functional block of Cool Runner. **[5]**

b) What are the problems caused by multiple activation of a process statement during one real time point? Explain remedy for these problems. **[5]**

Q3) a) Explain behavioural and data flow VHDL modelling techniques with example. **[4]**

b) Differentiate between the function and procedure in VHDL. **[4]**

c) Explain the significance of Chipscope Pro. **[2]**

Q4) a) Explain the boundary scanning mechanism. **[4]**

b) What are different ASIC Design tools? Describe any one in detail. **[4]**

c) What are the top down approaches to design a system? **[2]**

P.T.O.

Q5) a) Draw and describe Xilinx Virtex - II architecture. **[4]**

b) Explain the difference between simulation and synthesis. **[4]**

c) Write a note on hardware and software codesign. **[2]**

Q6) a) Classify and explain Gate array based ASICs. **[4]**

b) Why FPGAs are often used to implement pipelining effectively? **[4]**

c) Enlist applications of CPLDs. **[2]**

Q7) a) Write a note on IP core. **[4]**

b) Explain RTL to GDS - II flow in detail. **[4]**

c) What is the operator inference? **[2]**

Q8) a) Explain the three phases of simulation of VHDL code. **[5]**

b) Explain the ASIC design flow in detail. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4108

[Total No. of Pages : 2

[5255]-606

M.E. (Electronics) (Digital System)
RANDOM SIGNALS AND PROCESSES
(2013 Credit Pattern) (Semester-II) (504109)

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) Consider the random process $X(t) = A\cos(\omega_0 t + \Theta)$, where Θ is random variable uniformly distributed over the interval (0, 2*p*), and A and ω_0 are constants. **[5]**

Determine the power spectral density of this process.

b) Determine the autocorrelation function of the Wiener process. **[5]**

Q2) a) Classify probability distributions. Explain in detail different continuous distribution functions. **[5]**

b) Explain the properties of Binomial distribution with examples. **[5]**

Q3) a) Describe the important properties of autocorrelation and cross correlation. **[5]**

b) A random process has sample functions of the form $X(t) = A\sin(\omega t + \theta)$ where A and θ are statistically independent random variables and the frequency is constant. The random variable A is uniformly distributed from 0 to 10, and the random variable θ is uniformly distributed 0 to π. Is this process wide-sence stationary? **[5]**

Q4) a) What are moment generating functions and characteristic functions. Explain their importance. **[5]**

b) Write a note on central limit theorem. **[5]**

P.T.O.

Q5) a) Define central moments, skew and kurtosis for a random variables. **[5]**

b) Explain Maximal Likelihood Estimation in detail. **[5]**

Q6) a) Consider the random variable X with mean value 3 and variance 2. A second random variable Y is defined as Y = 3X– 11. Find the mean value of Y and the correlation of X and Y. **[5]**

b) Compare MMSE and MAP estimators with respect to accuracy and complexity. **[5]**

Q7) a) In on-off keying system, the source transmits signal of amplitude 1 volt or 0 volt. Noise $n(t)$ is added which has zero mean and variance = 1 and it is Gaussian. Set up the LRT (Likelihood Radio Test) for this problem. **[5]**

b) Define four properties of joint density function. **[5]**

Q8) a) Define and explain in detail Binary hypothesis test in detection of signals. **[5]**

b) State and explain Cramer - Rao inequality. What is need of an Estimator. **[5]**

Total No. of Questions :8]

SEAT No. :

P4109

[Total No. of Pages : 2

[5255] - 607

M.E. (Electronics) (Digital System)

IMAGE PROCESSING & COMPUTER VISION

(Semester III) (2013 Pattern) (604101)

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) ***Assume suitable data, if necessary.***

Q1) a) With help of neat diagram explain various steps in image processing? **[5]**

b) A 5×5 image patch is shown below. Compute the value of the marked pixel, if it is smoothened by a 3×3 weighted averaging filter. Use Zero padding **[5]**

F(m,n) =

0	1	2	3	2
5	6	7	8	4
4	3	2	1	2
8	7	6	5	3
1	5	3	7	8

Q2) a) Derive 2-DCT basis images of size 4×4 **[5]**

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

1. Canny Edge detection
2. Laplacian of Gaussian

Q3) a) With the help of block diagram explain JPEG compression technique? **[5]**

b) List out the major applications of DIP and Explain any two. **[5]**

P.T.O.

Q4) a) Explain in detail the different point processing techniques used for image enhancement. **[5]**

b) Perform the histogram equalization on the image given below **[5]**

1	4	1	7	1
2	2	3	1	2
1	5	5	2	4
2	6	6	3	5
2	7	7	5	6

Q5) a) What is primal sketch and 2.5D sketch **[5]**

b) Derive equation for camera calibration martix K. **[5]**

Q6) a) Derive the equation for the distance of object from the camera in terms of focal length. **[5]**

b) What is the need for image rectification? How it is performed? **[5]**

Q7) With reference of Radiometry and 3D vision explain the following terms **[5+5]**

a) Radiometry consideration in gray level

b) Surface reflectance

Q8) a) Explain feature based stereo correspondence. **[5]**

b) Explain different surfaces used in radiometry and also explain which is better. **[5]**

& & &

Total No. of Questions : 8]

SEAT No. :

P4110

[Total No. of Pages : 2

[5255]-608

M.E. (Electronics) (Digital System)
WIRELESS AND MOBILE TECHNOLOGIES
(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 electronic, pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain the following outdoor propagation models: **[5]**

i) Okumura model ii) Hata model

b) Explain the various factors influencing small scale fading. **[5]**

Q2) a) Explain the term hand off. How will you select the threshold for power received to take a decision for hand off ? How the channels are allocated when hand off occurs? **[5]**

b) Explain the various techniques to expand the capacity of cellulor systems. **[5]**

Q3) a) Explain the fixed TDMA with the help of diagram. **[4]**

b) Explain the Carrier Sense Multiple Access Scheme (CSMA). **[3]**

c) Explain slotted aloha scheme with neat diagrams. **[3]**

Q4) a) Explain the inhibit sense multiple access. **[3]**

b) What are the benefits of reservation schemes? How are collision avoided during data transmission? Why is the probability of collisions lower compared to classical Aloha? **[4]**

c) Explain code division multiple access. **[3]**

P.T.O.

Q5) a) Explain Indirect TCP. State its advantages. **[4]**

b) Explain Snooping TCP. State its advantages. **[4]**

c) What is the basic purpose of DHCP? **[2]**

Q6) a) Explain the packet delivery to and from the mobile node with the help of neat diagram. **[4]**

b) What are the differences between AODV and the standard distance vector algorithm. **[3]**

c) What is encapsulation? Why and where it is needed? **[3]**

Q7) a) Explain frame structure for GSM with a neat diagram. **[4]**

b) Explain the process in GSM for mobile originated call. **[4]**

c) What are the four possible handover scenarious in GSM. **[2]**

Q8) a) Draw GSM protocol architecture for signaling and explain. **[4]**

b) What is the additional mechanism in lEEE 802.11 standard to deal hidden node problem? **[3]**

c) Why is the PHY layer in 802.11 sub divided? Draw lEEE 802.11 protocol architecture. **[3]**

Total No. of Questions : 8]

SEAT No. :

P4111

[Total No. of Pages : 2

[5255]-609

M.E. (E&TC) (Microwave)

ELECTROMAGNETICS AND ANTENNA THEORY

(2013 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 indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Derive Maxwell's equations and explain its significance. **[5]**

b) Explain reflection and refraction in detail. **[5]**

Q2) a) Discuss different feeding techniques used in Microstrip antennas. **[6]**

b) Write a note on conical horn antenna. **[4]**

Q3) a) 'Draw and explain geometry of Yagi Antenna along with its advantages and disadvantages . **[5]**

b) Compare Binomial array with Dolph-Tchebysheffs array . **[5]**

Q4) a) Define following terms and their significance related to antenna **[5]**

i) Radiation pattern

ii) Polarization types

iii) Gain

iv) VSWR &

v) Return Loss

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

i) Helical antenna and

ii) Parabolic Reflector

P.T.O.

Q5) a) A Microstrip antenna with overall dimensions of L = 0.906cm, W = 1.186cm, substrate with height h=0.1588cm and dielectric constant = 2.2 is operating at 10GHz. Find **[7]**

i) input impedance &

ii) Position of feed point where input impedance is 50 ohm.

b) State the advantages of Microstrip Antenna. **[3]**

Q6) a) Design an circular aperture antenna with uniform illumination, so that the directivity is maximized at angle 30 degree from normal to aperture. Determine optimum dimension and directivity. **[5]**

b) Draw the geometry of Spiral antenna and explain its advantages and disadvantages. **[5]**

Q7) a) Explain how Mutual Coupling affects the performance of Array antennas. **[5]**

b) Explain Rhombic antenna with respect to geometry and radiation characteristics. **[5]**

Q8) a) Derive the equation for radiation resistance for a Half Wavelength dipole Antenna. **[5]**

b) Explain Pattern Multiplication for Array also explain significance of Array Factor. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4112

[Total No. of Pages : 2

[5255]-610

M.E. (E & TC) (Microwave)
RF AND MICROWAVE CIRCUITS
(2013 Pattern) (Semester-I) (504302)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions out of eight questions.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) Derive the expressions for Propagation Constant, Impedance , and Power Flow for the Lossless Coaxial Line. **[5]**

b) A transmission line with a characteristics impedance of $Z_0 = 50\Omega$ is terminated into the following load impedances: **[5]**

i) $Z_L = 0\Omega$ (short circuit)

ii) $Z_L = \infty$ (open circuit)

iii) $Z_L = 50\Omega$

iv) $Z_L = (16.67 - j\ 16.67)\Omega$

v) $Z_L = (50 + j150)\Omega$

Q2) a) Define the following terms w.r.t. microwave components: **[5]**

i) Sensitivity ii) Dynamic range

b) Explain with help of equivalent diagram construction and working of Lange Coupler. **[5]**

Q3) a) Write a short note on Inter-symbol Interference (ISI). **[5]**

b) For an arbitrary N port microwave device, derive the relationship between Transmission (ABCD) matrix and impedance matrix. **[5]**

P.T.O.

Q4) a) Explain with help of suitable diagram construction and working of varactor diode. **[5]**

b) Explain with help of suitable diagram construction and working of PIN diode. **[5]**

Q5) a) An RF power BJT generates a total power P_W of 15W at case temperature of 25°C. The maximum junction temperature is 150°C and the maximum ambient operating temperature is specified to be Ta = 60°C. What is the maximum dissipated power if the thermal resistance between case to sink and sink to air is 2°K/W and 10°K/W, respectively? **[5]**

b) Explain in detail the construction, working of n-channel MOSFET along with its electronic applications. **[5]**

Q6) Explain the unilateral design approach for amplifier design. Derive the unilateral figure of merit. **[10]**

Q7) Using signal flow graph of single stage amplifier, derive the following relationships: Incident power to the amplifier P_{inc}, available power P_A, Transducer gain G_T and Unilateral transducer gain G_{TU}. **[10]**

Q8) Describe in detail the construction, working of Tunnel diode along with its equivalent electric circuit representation. **[10]**

Total No. of Questions :6]

SEAT No. :

P4113

[Total No. of Pages :1

[5255] - 611

M.E. (E & TC) (Microwave)

MICROWAVE MEASUREMENT

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) Draw and Explain the characteristic impedance for a parallel wire transmission line. **[5]**

b) State the significance of measurement related to Microwave. **[5]**

Q2) Explain the concept of uncertainity and confidence in measurement of signals. **[10]**

Q3) State and Explain the important considerations while making attenuation measurement. **[10]**

Q4) Name the different RF voltage measuring instruments. Explain any one in detail with necessary diagram. **[10]**

Q5) What are the different types of Noise source. Explain the white Noise and Flicker Noise. **[10]**

Q6) Write short Note on : **[10]**

a) RF Power Measurement.

b) Spectrum Analyzer.

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Total No. of Questions : 8]

SEAT No. :

P4114

[Total No. of Pages :2

[5255] - 612

M.E. (E & TC) (Microwave)

Computational Electromagnetics

(2013 Pattern) (Semester - II) (504307)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Derive Green's function corresponding to PDE for free space. **[5]**

b) Explain overview of various computational methods. **[5]**

Q2) a) Compare FDM and FDTD modeling techniques. **[5]**

b) Explain applications of one dimensional FDTD analysis. **[5]**

Q3) a) Explain Ritz Variational method. **[5]**

b) Explain advances in FDTD technique. **[5]**

Q4) Explain in detail Green's function for two dimensional case. **[10]**

Q5) a) Explain in detail method of weighted residual. **[5]**

b) Explain the applications of Ritz Variational method. **[5]**

P.T.O.

Q6) Compare FDM, FDTD, FEM and MOM modeling techniques. **[10]**

Q7) a) Explain Point Matching method. **[5]**

b) Explain Galerkins method. **[5]**

Q8) Write short note on **[10]**

a) Band Matrix method.

b) Iteration method.

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Total No. of Questions : 8]

SEAT No. :

P4115

[Total No. of Pages : 2

[5255]-613
M.E. (E&TC) (Microwave)
RF AND MMIC TECHNOLOGY
(2013 Course) (Semester-II) (504308)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Compare HMICs and MMICs. Enlist advantages, disadvantages and applications of MMICs. **[6]**

b) Explain via holes and grounding methods used in MMICs. **[6]**

OR

Q2) Explain the working principle of microstrip couplers and power splitters. Discuss the design constraints for these devices. **[12]**

Q3) a) Enlist the methods for synthesis on nonlinear MICS. Explain any one in detail. **[6]**

b) Explain network matrix decomposition of the microwave circuit. **[7]**

OR

Q4) a) What is synthesis of MIC? Explain need of matrix representation for microwave multiport circuits. **[7]**

b) Explain synthesis of n-port on the base of elementary two port. **[6]**

Q5) a) Explain in detail the complete MMIC design cycle. **[7]**

b) Discuss the process for design of phase shifters. **[6]**

OR

P.T.O.

Q6) a) Explain the importance and working principles of GaAs FET MMIC switches. **[6]**

b) Describe important CAD package feature. **[7]**

Q7) With reference to RF and MMIC, write short notes on: **[12]**

a) Radio Systems

b) Satellite Communication

OR

Q8) With reference to RF and MMIC, write short notes on: **[12]**

a) Broadcast Systems

b) Future Trends in MMICs

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Total No. of Questions : 8]

SEAT No. :

P4116

[Total No. of Pages : 2

[5255]-614

M.E. (E & TC) (Microwave)
WIRELESS COMMUNICATION SYSTEM
(2013 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 Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Define the following terms of Tele-Traffic Engineering: **[5]**

i) Blocking Probability

ii) Grade of service

iii) Quality of service

iv) Block Call Held

v) Block Call Cleared

b) Explain the hand off mechanism used in Cellular Communication. **[5]**

Q2) a) Explain the hexagonal cell arrangement with reuse factor, cluster size and reuse ration to achieve the optimal co-channel interference. **[5]**

b) Derive and explain the Signal to Co-channel Interference ration for the worst-case scenario with Omni directional antenna. **[5]**

Q3) a) Write short note on Radio Wave Propagation. **[5]**

b) Explain the effect of earth's curvature and free space attenuation of mobile channel. **[5]**

Q4) a) What is the separation distance between the transmitter and receiver with an allowable path loss of 150 dB and shadow effect of 10 dB? **[5]**

b) Explain the Indoor path-loss model and Link Margin. **[5]**

P.T.O.

Q5) a) Write short note on data services in GSM. **[5]**

b) In the GSM cellular system, the one way bandwidth of the system is 12.5 MHz. The RF channel spacing is 200 KHz, 8 users per channel and 3 channels per cell are used for control channels. Calculate the spectral efficiency of modulation using following parameters: **[5]**

Area of cell = 8 km^2, Total coverage area = 4000 km^2,

Call blocking probability = 2% (106.2 Erlangs/cell), Frequency reuse factor = 7,

Average. no. of calls per user during the busy hour = 1.2,

Average holding time of a call = 100 seconds

Q6) a) List the GSM logical channels and explain their functions for cellular communication. **[5]**

b) Explain the forward and reverse link channel structure of IS-95 CDMA. **[5]**

Q7) a) Explain the control channels in CDMA. **[5]**

b) What are the UMTS system features? Draw the UMTS network architecture. **[5]**

Q8) a) Write short note on Beyond 3G. **[5]**

b) Explain the Radio Link Control protocol in UMTS. **[5]**

Total No. of Questions :6] SEAT No. :

P4117 [Total No. of Pages : 2

[5255] - 615

M.E.(E&TC) (Microwave)

EMI AND EMC TECHNIQUES

(2013 Pattern) (Semester - III) (604301)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) What are the types of EMI Suppression techniques? **[4]**

Explain grounding technique in detail.

b) Explain EMI prediction techniques and modeling methods. **[4]**

c) What is difference between inter system EMI and Intra system EMI? **[2]**

Q2) a) Draw and explain general flow diagram used for prediction and solving of EMI problem **[4]**

b) Explain in detail propagation model for amplitude culling. **[4]**

c) What is difference between conducted EMI and radiated EMI? **[2]**

Q3) a) Explain Modeling of Class A Interference. **[4]**

b) How to measure the common mode and differential mode interference voltages? **[4]**

c) What are the precautions required in earthing? **[2]**

P.T.O.

Q4) a) Explain the antennas used for open area EMI measurement. **[5]**

b) Explain the factors which influence on site attenuation and normalized site attenuation **[5]**

Q5) a) Explain common mode and differential mode filter design for power line. **[5]**

b) Write short note on lumped element low pass filter. **[5]**

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Q6) a) Explain design of telephone line filter and its characteristics. **[5]**

b) How isolation transformers are used to suppress the interference. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4118

[Total No. of Pages : 2

[5255]-616

M.E. (E & Tc) (Microwave)
RADAR & SATELLITE COMMUNICATION
(2013 Course) (Semester-III) (604302)

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) ***Assume suitable data, if necessary.***

Q1) a) Derive the radar range equation? Explain the factors that affect the maximum range of radar. **[6]**

b) Explain various display methods for radar system. **[4]**

Q2) a) Explain with neat block diagram the working principle of continuous wave radar. **[6]**

b) Discuss RCS for simple and complex targets. **[4]**

Q3) a) Write short notes on: **[4]**

i) Tracking Radars ii) Ambiguity in Range equation

b) Discuss the concept of Real array Imaging Radars. **[3]**

c) Explain how the radar is used in weather prediction. **[3]**

Q4) a) Explain in detail the radar design for surveillance radar. **[4]**

b) Explain the various Signal processing techniques in Radar system. **[6]**

P.T.O.

Q5) a) With respect to satellite communication explain the following: **[4]**

i) Kepler's law ii) Satellite Link Design

b) Explain with neat block diagram concept of TTC & M in satellite communication. **[6]**

Q6) a) Comment on orbital mechanism and launching of artificial satellite. **[4]**

b) Explain in brief the concept of link design for Geostationary satellites. **[6]**

Q7) a) With respect to satellite communication explain the following multiple access techniques: **[4]**

i) FDMA ii) SS-TDMA

b) Discuss in detail power budget analysis with respect to satellite communications. **[6]**

Q8) a) What are the various interferences in FDMA system. **[3]**

b) Comment on various applications and recent trends in satellite communications. **[4]**

c) Discuss the design considerations for a satellite antenna. **[3]**

Total No. of Questions : 8]

SEAT No. :

P4119

[Total No. of Pages : 2

[5255]-617

M.E. (E&TC) (Signal Processing)

IMAGE PROCESSING & ANALYSIS

(2013 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***All questions carry equal marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

Q1) a) With reference to relation between pixel explain 4 connectivity, 8 connectivity and mixed connectivity. With reference to this find the distance between pixels p and q. Using 4,8 & m-connectivity in given image V{0,1}. **[6]**

	3	1	2	1	(q)
	2	2	0	2	
	1	2	1	1	
(p)	1	0	1	1	

b) Explain the following **[4]**

i) Mean & Variance of image.

ii) Histogram of image

Q2) a) Explain the difference between image enhancement & restoration. List various algorithms used for image restoration. Explain how Wiener filter is used for image restoration. **[6]**

b) Explain in short following image enhancement technique **[4]**

i) Intensity level slicing

ii) Negative of an image

iii) Power law transformation

iv) Contrast streching

P.T.O.

Q3) a) What is DCT? Explain the different properties of DCT. Hence explain how DCT is useful in image compression. **[6]**

b) Explain frequency domain low pass filtering in detail. **[4]**

Q4) a) With reference to 2D transformation explain basis image, symmetry, separability & energy compaction. Also write a note on Haar transform. **[6]**

b) Explain 4-directional & 8-directional chain coding with example. Hence obtain the object shape represented by 8 directional chain code 466001225642(in anticlockwise direction). Assume suitable distance between chain code. **[4]**

Q5) a) List & explain types of thresholding used in image segmentation. **[6]**

b) Explain Hough transform with neat diagram. Why it is widely used in edge detection. **[4]**

Q6) a) Explain basic four operations of Morphology. Explain how a skeleton of an image is obtained using morphological operation. **[6]**

b) Explain how boundaries of an object is represented with the help of fourier driscriptors. **[4]**

Q7) a) With respect to image compression explain **[6]**

i) Entropy & entropy coding methods

ii) Redundancy & fidelity criteria

b) Explain baseline JPEG encoder in detail. **[4]**

Q8) a) Explain the need of color models. Compare YIQ & HIS color models. **[6]**

b) What is pseudo color processing? Explain in detail different techniques of pseudo coloring. **[4]**

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Total No. of Questions : 8]

SEAT No. :

P4120

[Total No. of Pages : 2

[5255]-618

M.E. (E & TC) (Signal Processing)
SIGNAL PROCESSING TECHNIQUES
(2013 Pattern) (Semester-I) (504402)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Solve any five questions.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Design a first order digital Butterworth high-pass filter for cut-off frequency of 30 Hz and sampling frequency of 150 Hz using bilinear transformation technique. **[5]**

b) Discuss the sampling rate conversion by a factor of I/D with the help of neat block diagram. **[5]**

Q2) a) A low-pass filter has the desired frequency response as given below:**[5]**

$$H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega} \text{ for } 0 \le |\omega| \le \pi/2 \\ 0 \text{ for } \pi/2 \le |\omega| \le \pi \end{cases}$$

Determine the filter coefficients $h(n)$ for M = 7 using frequency sampling technique.

b) Explain the least mean squares algorithm for designing of FIR Filter. **[5]**

Q3) a) Design a digital Butterworth filter using impulse invariance method for the following specifications: **[4]**

$$0.8 \le |H(e^{j\omega})| \le 1 \text{ for } 0 \le \omega \le 0.2\pi$$

$$|H(e^{j\omega})| \le 0.2 \text{ for } 0.6\pi \le \omega \le \pi$$

Assume T = 1 sec.

b) Explain barrel shifter and multiport memory of DSP processor. **[4]**

c) What is the need of anti-imaging filter in interpolator? Explain with neat diagram. **[2]**

P.T.O.

Q4) a) Explain how noise introduced in the signal is minimized using adaptive filter. **[4]**

b) Obtain the polyphase decomposition of the IIR system with transfer function - $H(z) = \frac{1-3z^{-1}}{1+4z^{-1}}$ for two sections. Also draw the polyphase structure. **[4]**

c) State the advantages of Kaiser window over other window functions? **[2]**

Q5) a) Find the Padé approximation of a second-order model with $p = q = 2$ for a signal $x(n)$ whose first five values are: $x = [1, 4, 2, 1, 3]^T$. **[4]**

b) What are the advantages and limitations of pipelining and parallel processing? **[4]**

c) What is frequency warping? What is its effect in filter design? **[2]**

Q6) a) Design a 2-stage decimator to reduce sampling rate from 240 kHz to 8 kHz and satisfies following specifications: **[4]**

Pass band ripple = 0.05, Stop band ripple = 0.001, Highest frequency of interest = 3.4 kHz. Assume decimation factors - 15, 2.

b) What is unfolding? Explain with suitable example. **[4]**

c) Show that the upsampler and downsampler are time variant systems. **[2]**

Q7) a) Explain various addressing modes of DSP processor. **[4]**

b) State the advantages of polyphase decomposition for IIR filter structure. **[4]**

c) How to overcome frequency warping effect in bilinear transformation? **[2]**

Q8) a) Explain the optimal FIR filter design method. **[4]**

b) Derive the expression for the output spectrum of decimator in terms of input spectrum. **[4]**

c) What are the limitations of least squares design method? **[2]**

Total No. of Questions :8]

SEAT No. :

P4121

[Total No. of Pages :2

[5255] - 619

M.E. (E & TC) (SP)

MIXED SIGNAL PROCESSING SYSTEM & DESIGN

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Figures to right indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Draw neat diagram wherever necessary.***

Q1) a) Draw and explain switched capacitor voltage amplifier using parallel resister emulation. **[5]**

b) Design switch capacitor summing amplifier for output Vtg during ϕ_2 phase period. **[5]**

$V_o = 10V_1 - 5V_2$

Q2) a) Draw z domain models for following switched capacitor circuits. Draw 4 port & 2 port models for each of following. **[5]**

i) Parallel switched capacitor.

ii) Capacitor in series s/w.

iii) Negative SC Transresistance.

iv) Positive SC Transresistance.

b) Describe non idealities in switched capacitor circuits due to mos Transisters & operational amplifiers. **[5]**

P.T.O.

Q3) a) Describe noise alising in switched capacitor filters. **[5]**

b) List advantage & disadvantages of switched capacitor circuits. **[3]**

c) Draw switched capacitor integrator (inverting type). **[2]**

Q4) a) Draw Block diagram of DAC with ideal o/p characteristics for 3 bit DAC. **[4]**

b) Find value of 1 LSB, percentage accuracy and full scale voltage generated for 3 bit & 8 bit DAC, $V_{ref^n} = 5V$. **[3]**

c) Draw block diagram of i/p and o/p testing of DAC. **[3]**

Q5) a) Difference between analog PLL and Digital PLL? **[5]**

b) With appropriate block diagram explain current scaling DAC. **[5]**

Q6) a) Explain Mixer type and XOR type phase frequency detector. **[5]**

b) Draw sample & hold circuit? Explain it's significance in ADC. **[3]**

c) Draw block diagram for FFT Test in ADC. **[2]**

Q7) a) Give note on self calibrating ADC. **[3]**

b) Draw block diagram of delta sigma DAC. Give it's advantages over other DACS. **[5]**

c) Explain significance of direct digital synthesis. **[2]**

Q8) a) Explain current starved VCO with the help of neat Fig. Write expressions for total capacitance. **[4]**

b) Explain SAR type ADC in detail. **[4]**

c) Draw block diagram of PLL and explain it's applications (any 2). **[2]**

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Total No. of Questions :8]

SEAT No. :

P4122

[Total No. of Pages : 2

[5255]-620
M.E (E & TC) (Signal Processing)
SPEECH SIGNAL PROCESSING
(2013 Pattern) (Semester - II)

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

Q1) a) Explain Phoneme classification with consonants in detail. Explain the production of consonants like | t |, | s | and | p |. **[5]**

b) Explain with block diagram parallel processing approach for calculation of pitch frequency. **[5]**

Q2) a) Define formant frequencies. How will you relate it to the vocal tract? Explain the measurement of formant frequencies using a cepstrum. **[6]**

b) What is power spectrum. Explain the welch method for estimating power spectral density. **[4]**

Q3) a) Explain Levinson - Durbin algorithm for calculation of predictor coefficients. **[4]**

b) How to convert LSFs to LPCs? **[2]**

c) Explain forward linear prediction method with its block diagram and show that error filter is FIR filter. **[4]**

P.T.O.

Q4) a) How to convert power spectrum to Mel scale? Explain the procedure of calculation of MFCC with block schematic. Explain how the integration of power is done Mel scale filters. How is spectral smoothing done. **[6]**

b) Compare the procedure to calculate MFCC with that of PLP. **[4]**

Q5) a) Explain Granular noise & slope overload noise. **[2]**

b) A speech signal has RMS amplitude of 5V. The signal to be coded using five bits. The signal density is assumed to be Laplacian. Find the step size, the quantization noise power and the SNR. **[4]**

c) Explain working of Jayant Quantizer with the help of block schematic. **[4]**

Q6) a) Explain atleast two methods of speech enhancement, if the speech is corrupted by periodic noise. **[4]**

b) What is speech enhancement. Explain spectral subtraction method of speech enhancement for removal of wide band noise with the help of block diagram. **[6]**

Q7) a) Compare speaker identification & speaker verification. Draw the block diagram of speaker identification & explain it. List the different features used for speaker recognition. **[6]**

b) What is echo? Draw the echo cancellation system & explain in detail. **[4]**

Q8) a) Use the Levinson - Durbin algorithm to compute the third order forward predictor for a signal s(n) with auto correlation sequence r (0) = 3, r (1) =2, r (2) =1 & r (3) = ½. **[4]**

b) Write a note on subjective and objective speech evaluation standard. **[4]**

c) Compare PCM, ADPCM and DM. **[2]**

Total No. of Questions : 8]

SEAT No. :

P4123

[Total No. of Pages : 2

[5255]-621

M.E. (E&TC) (Signal Processing)

ARCHITECTURE FOR SIGNAL PROCESSING ALGORITHM

(2013 Course) (Semester-II) (504408)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions out of eight questions.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator is permitted.***
4) ***Assume suitable data if necessary.***

Q1) a) Find the output y(n) of an LTI system if impulse response h(n) = {1,1,1} and the input signal x(n) = {3,-1,0,1,3,2,0,1,2,1} using overlap add and overlap save method. **[5]**

b) Explain Decimation In Time FFT approach in detail. **[5]**

Q2) a) What is real time filtering? How it is achieved in Overlap and Add method. **[5]**

b) Explain vector quantization in detail. **[5]**

Q3) a) What are the challenges in designing architectures for DSP algorithms? Explain. **[5]**

b) Explain 2-D DFT. What are its application. Explain its use with respect to image filtering. **[5]**

Q4) a) Write a short note on fast convolution. **[5]**

b) What are Unfolding technique and their properties? **[5]**

P.T.O.

Q5) a) Explain direct form of Finite impulse response digital filter. **[5]**

b) What is DWT? Explain in detail **[5]**

Q6) a) Explain mathematically how pipelining can achieve high speed and low power. **[5]**

b) List the application of unfolding. Explain any one in detail. **[5]**

Q7) a) Explain hybrid radix-2 addition and subtraction. **[5]**

b) Explain bit serial FIR filter. **[5]**

Q8) Write short note on:

a) Parallel multiplier. **[5]**

b) Canonic Signed Digit arithmetic. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4124

[Total No. of Pages : 2

[5255]-622

M.E. (E & TC) (Signal Processing)
BIOMEDICAL SIGNAL PROCESSING
(2013 Pattern) (Semester-II) (Elective-III) (504409)

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 side indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Explain the anatomy of heart in detail. **[6]**

b) With the help of neat waveform explain ECG and its generation in detail. **[4]**

Q2) a) Draw and explain Nerve Cell structure. **[6]**

b) Explain various transducers used in Biomedical systems. **[4]**

Q3) a) Explain the generation of EEG waveform and explain EEG acquisition. **[6]**

b) Specify different frequency ranges in EEG. **[4]**

Q4) a) What is Instrumentation amplifier? Write equation for V_{out} in it. What is its significance in Biomedical signal processing. **[6]**

b) Explain techniques of grounding and shielding implemented for electrical safety of Medical Instruments. **[4]**

Q5) a) Discuss advantages of FIR IIR filters. **[6]**

b) Write short note on Wiener filter. **[4]**

P.T.O.

Q6) a) Explain application of Wavelet Transform in Biomedical signal analysis. **[6]**

b) Explain STFT. Discuss its short comings. **[4]**

Q7) a) State the methods for detection of QRS complex. Draw flowchart for PanTomkins Algorithm technique. **[6]**

b) Write a note on phonocardiogram. Explain its recording. **[4]**

Q8) a) Explain the basic principle involved in reconstruction of images for PET, SPECT and CT. **[6]**

b) Briefly explain the steps to implement PCA. **[4]**

Total No. of Questions :8]

SEAT No. :

P4125

[Total No. of Pages :2

[5255] - 623

M.E. (E & Tc) (Signal Processing)

STATISTICAL SIGNAL PROCESSING

(2013 Pattern) (Semester - III)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) What is signal modeling and least square method of signal modeling? Enlist advantages and disadvantages of least square method of signal modeling. **[5]**

b) A signal x is given below that is to be approximated use pade approximation for p = 0, q = 2 and p = q = 1.

X = {1, 1.500, 0.750, 0.375, 0.185, 0.0938} **[5]**

Q2) a) Given the signal x(n) consisting single pulse of length N

X(n) = 1 ; n = 0, 1, 2,.....N–1

0 ; n = elsewhere

Use PRONEY'S method to model x(n), having one pole and one zero. **[5]**

b) State and explain Shank's method of signal modeling in detail. **[5]**

Q3) a) Explain in detail AR, MA and ARMA process. **[5]**

b) Find ARMA (1, 1) model for real valued random process x(n) having autocorrelation values $r_{x(0)} = 26$, $r_{x(1)} = 7$, $r_{x(2)} = 7/2$ Using modified Yule Walker Equation. **[5]**

P.T.O.

Q4) a) Explain signal modeling with AR(p) process using Yule walker equation. **[5]**

b) Explain how Levinson - Durbin algorithm is used to find moving average model parameters. **[5]**

Q5) a) Derive Wiener Hopf equation for causal FIR wiener filter. Also give expression for minimum error in terms of autocorrelation matrix R(x). **[5]**

b) Solve the autocorrelation normal equations and find third order all - pole model using Levinson - Durbin recursion, for a signal having autocorrelation values

$r_x(0) = 1, r_x(1) = 0.5, r_x(2) = 0.5, r_x(3) = 0.25.$ **[5]**

Q6) a) Explain what do you mean by WideSence stationary processes (WSS). **[3]**

b) Explain any one method of parametric spectrum estimation. **[4]**

c) Derive expression of forward prediction error E_{j+1} as a O/P of forward prediction error filter. **[3]**

Q7) a) Is spectrogram and Periodeogram different? Name any two methods to estimate each of these. **[3]**

b) Write LMS algorithms for nth order FIR filter. State its convergence property. **[3]**

c) Explain Orthogonality principle for linear estimators hence Explain MVUE - minimum variance unbiased estimates. **[4]**

Q8) a) Explain how wiener filter can be used for noise cancellation. **[3]**

b) Explain Welch estimate of the power spectrum. **[4]**

c) Draw block diagram of adaptive filter and explain its applications. **[3]**

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Total No. of Questions : 8]

SEAT No. :

P4126

[Total No. of Pages : 2

[5255]-624

M.E. (E & TC) (Signal Processing)

STILL IMAGE AND MOVING PICTURE COMPRESSION STANDARDS

(2013 Credit Pattern) (Semester-III)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) With the help of sketches explain the goals and benefits of fractional bit plane coding in EBCOT algorithm. **[5]**

b) Analyze and comment on salient features of EZW algorithm. **[5]**

Q2) a) Discuss the different elements of Preprocessor in JPEG 2000. **[5]**

b) What is the necessity for using DWT in JPEG 2000? What is the recommendation for filter banks for lossy and lossless coding? **[5]**

Q3) a) Compare Tier 1 and Tier 2 coding in JPEG 2000. **[5]**

b) Explain the need for standardization in image transmission and reception. Illustrate the interleaved and non-interleaved ordering for color images. **[5]**

Q4) a) With the help of Block Diagram explain MPEG 1 video encoder. **[5]**

b) Describe the motion compensation features of MPEG 1. **[5]**

P.T.O.

Q5) a) State the need for Quantization weighting Matrix and give the Default Intra and Inter Quantization weighting Matrix. **[5]**

b) Explain the purpose and features of Video Buffer Verifier. **[5]**

Q6) a) What are the advantages and disadvantages of Scalability? **[5]**

b) Compare MPEG 1 and MPEG 2. **[5]**

Q7) a) Describe Switched Multipoint Functionality of H.263. **[5]**

b) How protection against error is provided in H.263. **[5]**

Q8) a) Compare MPEG-4 with H.263. **[5]**

b) Give the structure for VOP encoder. Explain how VOP is formed. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4127

[Total No. of Pages : 2

[5255]-625

M.E. (Electronics and Telecommunication)
MODELLING AND SIMULATION OF COMMUNICATION NETWORKS
(2013 Course) (Semester - I) (504501)

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) How to create a simulation model of communication system and discuss on at least two technologies used for creation. **[5]**

b) What is Performance estimation? Explain any one methodology in detail. **[5]**

Q2) a) How the selection of Sampling Frequency plays a significant role in performance of any communication system and explain it with suitable example. **[5]**

b) Illustrate the concept of up sampling and down sampling with reference to the simulation of communication system. **[5]**

Q3) a) Explain the Low Pass Complex Envelope for bandpass signals related to simulation in time and frequency domain. **[5]**

b) An angle modulated signal is defined by

$X(t)= 10 \cos[2\pi(100)t+2 \sin(2\pi(10)t]$

Determine the direct and quadrature phase components and plot them. **[5]**

P.T.O.

Q4) a) Justify the role of uniform random numbers in the simulation of communication system. **[5]**

b) Explain the working of linear congruence generator with a neat sketch. **[5]**

Q5) a) Explain the characteristics of pseudo random sequence and its importance in communication system with examples **[5]**

b) Compare and contrast semi analytic method of simulation with Monte Carlo method. **[5]**

Q6) a) How queuing model is useful for simulation and discuss about the types of queuing models in brief **[5]**

b) Explain in detail how poissionian modeling is used in simulation of Network Traffic. **[5]**

Q7) a) Explain in brief the role of pdf estimators in overcoming the long run time requirements of Monte Carlo method. **[5]**

b) What are the various specifications to be considered with respect to the simulation of multi path fading channel in a wireless communication system. **[5]**

Q8) a) Derive and demonstrate two state Markov model for discrete channel with memory. **[5]**

b) Write short note on: **[5]**

i) Tapped delay line model

ii) Impact of nonlinearities on the modeling of system

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Total No. of Questions : 8]

SEAT No. :

P4128

[Total No. of Pages : 2

[5255]-626

M.E. (E & TC) (Communication Networks)
SPREAD SPECTRUM AND CDMA SYSTEMS
(2013 Course) (Semester-I) (504502)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Assume suitable data if necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Use of calculator is allowed.***

Q1) a) Explain the multiple-dwell detector function with a flow chart or a state transition diagram. **[5]**

b) Explain DSSS receiver using serial search synchronization technique. **[5]**

Q2) a) With the help of an example, explain concept of shadowing. **[5]**

b) Explain the block interleaver and convolutional interleaver. **[5]**

Q3) a) Explain wide-sense stationary uncorrelated scattering (WSSUS) fading channel with its mathematical expressions. **[4]**

b) State the partial autocorrelation properties of sequences. **[2]**

c) Explain various methods of diversity in radio systems. **[4]**

Q4) a) Write short note on convolution codes. **[5]**

b) Divide $f(x) = 1 + x + x^4 + x^5 + x^6$ by $g(x) = 1 + x + x^3$. **[5]**

P.T.O.

Q5) a) Explain the Network planning for WCDMA system. **[4]**

b) Explain the conceptual block diagram of IS-95 for forward and reverse link channels. **[6]**

Q6) a) Discuss handoff mechanisms in CDMA technology. **[5]**

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

Q7) a) Explain the medium access in WCDMA. **[4]**

b) Discuss important features for CDMA Technology. **[2]**

c) Explain GSM SFH digital cellular system. **[4]**

Q8) a) Explain the radio resource management for IS-95. **[4]**

b) Compare IS 95 and CDMA 2000 technologies. **[6]**

Total No. of Questions :7]

SEAT No. :

P4129

[Total No. of Pages :2

[5255] - 627

M.E. (E & TC) (Communication Network)

DETECTION AND ESTIMATION THEORY

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) a) Classify and brief signals and systems. **[2]**

b) With neat diagram, explain multiple and composite Hypothesis system. **[4]**

c) Explain with block diagram, CFAR detection in radar system. **[4]**

Q2) a) Write a brief note on Gauss - Markov models. **[2]**

b) Derive an expression for probability of a correct decision using Hypothesis testing. **[4]**

c) With neat block diagram, explain the working operation of co-relation receiver for detection of known signals in white noise. **[4]**

Q3) a) Compare and explain with neat diagram continuous no - memory and with memory modulation system. **[5]**

b) Draw neat diagram of Multilevel modulation system to explain FM/FM system. **[5]**

P.T.O.

Q4) a) Define complete orthonormal set (CON) in determining orthogonal representations in Random processes. Derive an expression for CON. **[5]**

b) With neat diagram, generate expansion coefficients with correlation and match filter operation. **[5]**

Q5) a) Explain in brief the process to estimate random and non random parameters. **[2]**

b) Derive an expression for likelihood function using maximum likelihood estimator. **[4]**

c) With neat equation, explain the significance of 3 cost function in Bayes estimation. **[4]**

Q6) a) Define Linear transformation and orthogonality principle in filtering. **[2]**

b) Determine the minimum mean - square error to estimate S(t) in terms of present value of Y(t) in presence of wide - sense stationary process. The observation process is given by $Y(t) = S(t) + N(t)$ **[4]**

c) Define Interpolation. Estimate Y(t) in the interval $t \in [0, T]$ to determine minimum mean - square error. Assume Y(0) and Y(T) is given. **[4]**

Q7) a) List out to brief properties of optimum process. **[2]**

b) Explain with mathematical expression forward and backward linear prediction for Linear estimation. **[4]**

c) With neat diagram, explain the operation of Weiner filters for filtering and prediction. **[4]**

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Total No. of Questions : 8]

SEAT No. :

P4130

[Total No. of Pages :2

[5255] - 628

M.E. (E & TC) (Communication Network)

TRAFFIC ANALYSIS AND QOS

(2013 Pattern) (504507) (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) ***Use of Calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain SNMP standard & information model? **[4]**

b) Explain basic foundation of network management & communication model? **[4]**

c) Explain network statistics? **[2]**

Q2) a) Explain MIB Engineering? **[4]**

b) Explain TMN Conceptual Model? **[4]**

c) Explain OAM management? **[2]**

Q3) a) Explain in detail functional model with neat diagram? **[4]**

b) Write short note on broadband network services? **[4]**

c) Prepare a chart for functional roll of management tools? **[2]**

P.T.O.

Q4) a) Explain network management system? **[4]**

b) Explain performance requirement & metrics? **[4]**

c) What are the network management standards? **[2]**

Q5) a) Explain Link Level Flow & Error control? **[4]**

b) What is MPLS? Describe in short? **[4]**

c) What are Service categories define by ATM forum? **[2]**

Q6) a) Explain Integrated Services? **[4]**

b) What are the policies used for TCP implementation? **[4]**

c) Explain protocols for QoS support? **[2]**

Q7) a) Explain mechanism for congestion control? **[4]**

b) Explain the effect of window size performance? **[4]**

c) Explain QoS parameters define by ATM forum? **[2]**

Q8) a) Explain high speed network in terms of performance modeling & estimation? **[4]**

b) Explain the RSVP operation by using filtering q sub stream? **[4]**

c) What is the requirement of Fiber channel? **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4131

[Total No. of Pages : 2

[5255]-629

M.E. (E&TC) (Communication Networks)
BROADBAND WIRELESS TECHNOLOGIES
(2013 Course) (Semester - II) (504508)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Figures to the right indicate full marks.***
3) ***Your answer will be valued as a whole.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain SC-FDMA(Single-carrier frequency-division multiple access) System with a suitable block diagram. **[5]**

b) Derive expression for Channel capacity of SISO channel. Hence compare the Capacity for AWGN channels and SISO Rayleigh fading channels. **[5]**

Q2) a) Explain the variation in the system capacity for multi-class traffic with variation in channel parameters as CMl, CM2, CM3 and CM4. Also specify the variation in these channels. **[4]**

b) Explain DS (Direct Sequence) UWB with MIMO. **[4]**

c) What is Multiband OFDM UWB? **[2]**

Q3) a) Discuss the following WirelessMAN PHY Specifications **[4]**

i) WirelessMAN-OFDM PHY

ii) WirelessMAN-OFDMA PHY

b) Draw and explain TDD MAC frame format of the Wireless MAN-SC PHY. **[4]**

c) Draw and explain general form of MAC PDU format. Hence indicate Classification and CID mapping. **[2]**

P.T.O.

Q4) a) Explain general properties of WiMAX Mesh. **[4]**

b) Explain horizontal hand off and vertical hand off with reference to mobility in WiMAX networks. **[4]**

c) Write a short note on: Wi-Fi and WiMAX integration. **[2]**

Q5) a) Explain Data Link Layer Protocols for PON. **[4]**

b) Describe Class-of-Service Oriented Packet Scheduling(COPS) Algorithm for Dynamic Bandwidth Allocation. **[4]**

c) Draw and explain generic Multi-Point Control Protocol(MPCP) frame format. **[2]**

Q6) a) Explain QoS-Enabled Dynamic Bandwidth Allocation algorithm(DBAs) for EPONs. **[4]**

b) Compare and contrast Separate Time and Wavelength Assignment and Combined Time and Wavelength Assignment for multichannel EPONs. **[4]**

c) Write a short note on: Bandwidth Management for Multichannel EPONs. **[2]**

Q7) a) Explain Hybrid Architecture of Integrated EPON and WiMAX. **[4]**

b) Explain Multistage-integrated EPON and WiMAX systems. **[4]**

c) Write a short note on: IP layer packet forwarding in integrated EPON and WiMAX networks. **[2]**

Q8) a) Compare Capacity and Delay-Aware Routing(CaDAR) and GROW-Net Integrated Routing(GIR) for WOBAN routing. **[4]**

b) Discuss Traffic Management and Security issues for Point-to-Point FTTx. **[4]**

c) What are major advantages of a WOBAN over the wireline optical and wireless networks. **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4132

[Total No. of Pages : 2

[5255]-630

M.E. (E & TC) (Communication Networks)
OPTICAL NETWORKS
(2013 Pattern) (Semester-II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Assume suitable data if necessary.***
4) ***Use of calculator is allowed.***

Q1) a) Explain MPLS & optical cross connect table and state their advantages. **[5]**

b) What are the optical amplifiers? Explain it in detail. **[5]**

Q2) a) Describe the multiplexing techniques used to increase the transmission capacity of a fiber used in optical networks. **[5]**

b) Explain the optical layer hierarchy with neat diagram. **[5]**

Q3) a) What is the concept of digital wrapper? Explain in detail. **[5]**

b) Draw and explain OTN layered architecture. **[5]**

Q4) a) Write a note on Wavelength Stabilization. State its advantages. **[5]**

b) Explain IP based Internet transport network protocol stack with neat diagram. **[5]**

Q5) a) Describe BLSR in detail. **[5]**

b) What is tunable DWDM laser? Explain. State its limitations and applications. **[5]**

P.T.O.

Q6) a) Explain concept of label swapping & traffic forwarding. **[4]**

b) Write short notes on the following: **[6]**

i) PON ii) GFP

Q7) a) Explain Multiprotocol Lambda Switching (MPλS) and state its applications. **[4]**

b) Write short notes on following (Any Two): **[6]**

i) Couplers.

ii) Isolators.

iii) Circulators.

Q8) a) Explain Add-Drop Multiplexer in detail. State its advantages and applications. **[4]**

b) Write short notes on the following: **[6]**

i) Protocol stack alternatives.

ii) Crosstalk.

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Total No. of Questions :8]

SEAT No. :

P4133

[Total No. of Pages :2

[5255] - 631

M.E. (E & TC) (Communication Network)

MOBILE COMPUTING

(2013 Pattern) (Semester - III) (604501)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any Five Questions out Of Q1.to Q8.***
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 characteristics of mobile computing environment? **[5]**

b) Explain three tier architecture of mobile computing? **[5]**

Q2) a) Explain various services, application and limitation of GPRS. **[5]**

b) Compare 3G and 4G technology of mobile communication. **[5]**

Q3) a) Explain GPRS transmission plane protocol architecture. **[4]**

b) Discuss the physical layer of GSM system. **[4]**

c) How can IP help to transport multimedia data? **[2]**

Q4) a) What is WAP? Explain in detail. **[4]**

b) What are the standards for wireless security? **[4]**

c) Write a note on CDMA. **[2]**

P.T.O.

Q5) a) Explain the fundamentals of wireless Markup language WML script applications. **[4]**

b) Discuss the authentication process in 802.11 frame work. **[4]**

c) What are the advantages of Wireless network? **[2]**

Q6) a) What is handoff mechanism? Explain in details. **[4]**

b) Explain 4-G LTE network architecture. **[4]**

c) Write a note on Mobile IP. **[2]**

Q7) a) Discuss multipath propagation with an example. **[4]**

b) Explain in details about VOIP architecture? **[4]**

c) Write a note on Pico net. **[2]**

Q8) a) Describe the protocol stack of Bluetooth? **[4]**

b) How can we provide privacy in a wireless network? **[4]**

c) Write a short note on Bluetooth. **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4134

[Total No. of Pages : 3

[5255]-632

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 stream tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) What are the different Band pass modulation Techniques? Explain one in detail. **[4]**

b) Explain matched Filter Receiver used for implementing the optimum receiver for AWGN channel. **[4]**

c) Explain spectral attributes of PCM waveforms in detail. **[2]**

Q2) a) Explain the following with reference to the digital modulation: **[5]**

i) BPSK

ii) MSK

iii) QPSK

b) Two basis functions are given for transmitting information over an AWGN channel. The noise is assumed to have zero mean and PSD No/2, determine the impulse responses of matched filter demodulators and the output waveforms when the transmitted signal is $s_1(t)$. **[5]**

$$f_1(t) = \sqrt{\frac{2}{T}} \quad 0 \le t \le T/2$$
$$= 0 \quad \text{otherwise}$$

$$f_2(t) = \sqrt{\frac{2}{T}} \quad T/2 \le t \le T$$
$$= 0 \quad \text{otherwise}$$

P.T.O.

Q3) a) Explain correlation demodulator in detail. **[4]**

b) Derive the expression for output SNR of matched filter. **[4]**

c) Explain following nonlinear modulation methods with memory **[2]**

i) CPFSK ii) CPM

Q4) a) Explain the factors influencing small scale fading in detail. **[4]**

b) Explain fading effects due to **[4]**

i) multipath time delay spread and

ii) Doppler Spread.

c) Explain: **[2]**

i) Coherence Bandwidth

ii) Doppler Spread and

iii) Coherence time.

Q5) a) How symbol synchronization is achieved in binary PSK receiver. **[4]**

b) Consider the transmitter which radiates a sinusoidal carrier frequency of 1850 MHz. For a vehicle moving 60 mph, 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) Explain Maximum Likelihood carrier phase estimation. **[2]**

Q6) a) Explain rake receiver in detail. **[5]**

b) Describe different types of symbol synchronization techniques. **[5]**

Q7) a) Explain various diversity techniques. **[4]**

b) Describe adaptive decision feedback equalizer. **[4]**

c) What do you mean by self recovering (Blind) Equalization? **[2]**

Q8) a) Explain in brief: **[4]**

i) KALMAN algorithm for Adaptive Equalization.

ii) Stochastic gradient algorithm for Blind Equalization.

b) Explain Early-Late Gate synchronizer in detail. **[4]**

c) Write short note on Costas Loop. **[2]**

Total No. of Questions : 8]

SEAT No. :

P4135

[Total No. of Pages : 2

[5255]-633

M.E. (E&TC) (VLSI & Embedded Systems)

DIGITAL CMOS DESIGN

(2013 Pattern) (Semester - I) (504201)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Assume suitable data if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non programmable pocket calculator is allowed.***

Q1) a) Explore MOSFET diffusion capacitances along with the effect of operating regions. **[5]**

b) What are the wiring parasitics that play important role in digital design? Explain in detail. **[5]**

Q2) a) What is propagation delay? How does it play important role in power delay product? **[5]**

b) Explore fan in & fan out along with the appropriate equations. **[5]**

Q3) a) Explain the concept of stick diagram. With the help of suitable example ckt, draw its stick diagram. **[4]**

b) Write note on CMOS fabrication process. **[4]**

c) Explain transient response. **[2]**

Q4) a) A CMOS logic has 1 Million MOSFETs. The leakage per MOSFET is 1 pA. Calculate static power dissipation if the supply voltage is 2.5 Volt. What is effect of integration on static dissipation? **[4]**

b) What is need of logical efforts? Explain with example. **[4]**

c) Write note on dynamic dissipation. **[2]**

P.T.O.

Q5) a) With the help of suitable example, explain the difference between compound gate & transmission gate based implementations. **[4]**

b) Draw 8:1 Mux using transmission gates. What are the merits & demerits of implementations using transmission gates. **[4]**

c) Write note on Static CMOS logic. **[2]**

Q6) a) What is meant by static 1, 0 & dynamic hazard? Draw ckt & explain with timing diagram. **[4]**

b) Draw FSM diagram of 4 bit ring counter & write HDL code for it. **[4]**

c) What is meant by active area occupied by logic on chip? **[2]**

Q7) a) Explore NORA logic in detail. **[4]**

b) What is need of difference amplifier ckt in logic? Explain with timing diagram. **[4]**

c) Write note on ratioed ckts. **[2]**

Q8) a) Explain cascode voltage switch logic. What are prominent merits & demerits? **[4]**

b) Write note on comparison of ckt families. **[4]**

c) Explain high speed logic design techniques. **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4136

[Total No. of Pages : 2

[5255]-634

M.E. (E & TC) (VLSI & Embedded System)
EMBEDDED SYSTEM DESIGN
(2013 Pattern) (Semester-I) (504103)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***All questions carry equal marks.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain pair of design metrics that may complete with one another. Give reasons behind the competition. **[3]**

b) Explain the 'V' cycle model for Development of an Embedded system, with diagram. How verification & validation is concluded against specifications. **[4]**

c) Compare functional and architectural model of an Embedded System. **[3]**

Q2) a) Explain advantage and disadvantages of system on Chip. **[3]**

b) List Software Tools used in Embedded System Design & Development. Explain it. **[3]**

c) Discuss the constraints that should be considered when formulating a design specification for an Embedded System. **[4]**

Q3) a) Explain the architecture of ARM 9 processor with diagrams. **[5]**

b) Discuss the architectural support provided in ARM 9 processor for system Development. **[5]**

Q4) a) Explain the terms cache Replacement policy and cache write techniques in cache memory design. **[4]**

b) Explain in details memory Hierarchy & memory subsystem architecture. **[3]**

c) Write note on I2C & SPI protocol. **[3]**

P.T.O.

Q5) a) Explain the typical set up for development of an Embedded Linux System. **[3]**

b) What do you mean by Kernel Intialization. **[3]**

c) What are different types of Device Drivers. Explain any one with reference to Embedded Linux. **[4]**

Q6) a) What is Role of Boot-loader. Explain process of Boot-loading. **[4]**

b) Explain "Flash File System" in an Embedded linux system. **[3]**

c) Explain in brief the Kernel configuration (K config) file. **[3]**

Q7) a) What is "Android Manifest"? Explain in brief the structure of an Android mani-fest file. **[5]**

b) Explain various Network Services supported by Android OS. **[5]**

Q8) a) Write short note on advance operations with Android like telephony & SMS. **[4]**

b) Explain content providers with reference to Android OS. **[3]**

c) Explain the structure of an Android Application. **[3]**

Total No. of Questions :8]

SEAT No. :

P4137

[Total No. of Pages :2

[5255] - 635

M.E. (E & TC) (VLSI & Embedded Systems)

RECONFIGURABLE COMPUTING

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) Elaborate on comparison of Domain specific processor over General purpose processor. **[4]**

b) Explain the concept "Reconfigurable computing". Discuss fields in which RC is applicable. **[4]**

c) Differentiate between configurable and programmable devices. **[2]**

Q2) a) Discuss general purpose computing issues **[5]**

b) Explain the various delays with which VLSI structures have to deal with. **[5]**

Q3) a) Write in brief about the metrics Functional Density and Functional Diversity in reference with Reconfigurable computing. **[4]**

b) Give the review of General purpose processor and VLIW processor and DSP Processor in age of MOS VLSI. **[4]**

c) Draw and explain 4 - LUT. **[2]**

P.T.O.

Q4) a) What are issues in Reconfigurable network design. **[4]**

b) Explain influence of Rent rule on channel and wire growth using suitable formulae. **[4]**

c) Write short note on Mesh interconnect. **[2]**

Q5) a) Explain Switch Requirements for interconnectivity of FPGAs depending on number of LUT. **[5]**

b) What is need of instruction compression? What are its techniques? **[5]**

Q6) a) What is context? Why are contexts important in reconfigurable devices? **[4]**

b) Formulate the area required for bit processing element using RP space area model. **[4]**

c) Explain the term Granularity give suitable example. **[2]**

Q7) a) Suggest applications of Compile time reconfiguration and Run time reconfiguration. **[5]**

b) Draw and Explain architecture of DPGA. **[5]**

Q8) a) Explain role of RC in rapid prototyping. **[5]**

b) With help of diagram explain TSFPGA as reconfigurable architecture. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4138

[Total No. of Pages :2

[5255] - 636

M.E. (E & TC) (VLSI & Embedded System)

Analog CMOS Design

(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) ***Assume suitable data if necessary.***

Q1) a) With the help of a diagram, explain small signal high frequency model for the MOS transistor. **[5]**

b) Draw the tables for dependence of small signal model parameters on the dc values of voltage & current in the saturation and non saturation region. **[5]**

Q2) a) Explain the effect of channel length modulation and body effect on MOSFET & show how these are accounted in basic small signal model. **[4]**

b) Write short note on CMOS inverter as an amplifier. **[3]**

c) Draw and explain single MOSFET current sink. **[3]**

Q3) a) Explain active load inverter with neat diagram with transfer characteristics. **[4]**

b) Draw and explain CMOS OPAMP. **[3]**

c) What are limitations/constraints due to output offset voltage of CMOS Opamp? **[3]**

P.T.O.

Q4) a) Carry out large signal analysis of CMOS differential amplifier and findoutV_{OUTmax}, V_{OUTmin} and ICMR. **[4]**

b) Which are dominant noise in CMOS Opamp? List the techniques to reduce these noise. **[3]**

c) List and elaborate static characteristics of Digital-to-Analog converter. **[3]**

Q5) a) Explore open circuit time constant method analytically in detail. **[5]**

b) Design multistage amplifier for AV = 40 dB and bandwidth = 100 MHz. Comment on r_{OUT}. Assume suitable data. **[5]**

Q6) a) What are the constraints on input admittance of tuned amplifier? Explore unilateralization and neutralization in short. **[4]**

b) Explain the concept of Zero as bandwidth enhancers. **[3]**

c) What are techniques to improve bandwidth? **[3]**

Q7) a) Explain differential LNA with neat circuit diagram. **[4]**

b) Explain design considerations for RF chip design. **[4]**

c) Write Short notes on Band gap Reference Source. **[2]**

Q8) a) Draw schematic of any one type of CMOS mixer and explain its design with analysis. **[5]**

b) How nonlinear systems work as linear mixers? Explain square-law MOSFET mixer with neat circuits. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4139

[Total No. of Pages : 2

[5255]-637

M.E. (E&TC) (VLSI and Embedded Systems)

SYSTEM ON CHIP DESIGN

(2013 Course) (Semester-II) (504208)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) What are the limitations of data flow models? How these are overcome by Data flow models? **[4]**

b) Explain in detail abstraction levels with examples. Which is predominantly used in SoC modelling? **[4]**

c) Explain generic template for a system-on-chip. **[2]**

Q2) a) Explain with an example multi thread dynamic schedules. **[4]**

b) Explain datapath architecture in detail along with its design rules. **[4]**

c) Explain the concept of sequential targets with static schedule. **[2]**

Q3) a) Differentiate: micro-programmed machine Vs FSMD. **[4]**

b) How to map dataflow into software using sequential schedule? **[4]**

c) Draw and explain control flow graph of : **[2]**

i) if-then-else

ii) while-do

Q4) a) How limitation of a one-way handshake is overcome by two-way handshake? Explain with an example. **[4]**

b) Explain with an example slave and master handshakes. **[4]**

c) What are prominent features of FSL handshake protocol? **[2]**

P.T.O.

Q5) a) Define Uncertainty. What are causes to occur uncertainty? **[4]**

b) Explain importance of low power. How power analysis plays a vital role in SoC designs? **[4]**

c) Explain with example concept of slew measurement. **[2]**

Q6) a) Explain different sequential arcs with examples. **[4]**

b) What is fundamental philosophy to enabled synchronization? **[4]**

c) Where FIFO based mechanism are useful? **[2]**

Q7) a) Explain dynamic power management. **[4]**

b) Explain the low-power bus encoding. **[4]**

c) Which techniques are employed for reducing leakage power? **[2]**

Q8) a) Draw and explain flowchart for the TGS. **[4]**

b) Explain hard real-time DPM polices. **[4]**

c) Compare different framework based on their characteristics. **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4140

[Total No. of Pages : 2

[5255]-638

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) ***Answer any five questions.***
2) ***Draw neat diagrams wherever necessary.***
3) ***All questions carry equal marks.***
4) ***Assume suitable data wherever required.***
5) ***Figures to right indicates full marks.***

Q1) a) Define Causal system. Comment on causality of LTIDT system. **[4]**

b) Discuss Linear Convolution with suitable example. **[3]**

c) Discuss Moving Average filters. **[3]**

Q2) a) Discuss Structures and Characteristics of IIR Filters. **[4]**

b) Explain design of FIR Filters. **[3]**

c) Explain applications of Notch Filters. **[3]**

Q3) a) Explain Linear & Non-Linear filters with suitable examples. **[4]**

b) Explain Design and Applications of Adaptive Filters. **[3]**

c) Write a short note on FFT. **[3]**

Q4) a) Discuss design steps of IIR filters using Bilinear Transformation method. **[4]**

b) Write a short note on DFT. **[3]**

c) Explain FFT. **[3]**

P.T.O.

Q5) a) What are structures? Explain its types. **[4]**

b) Explain the characteristics of Window Function. **[3]**

c) Write short note on Gibb's phenomenon. **[3]**

Q6) a) Explain silent features of TMS 320C6713 digital signal processor. Also draw the functional diagram of the same. **[4]**

b) Explain application of DSP in image processing. **[3]**

c) Write short note on Gibb's phenomenon. **[3]**

Q7) a) Explain the in detail hardware MAC unit for DSP. **[4]**

b) Give different addressing formats of DSP processors. **[3]**

c) With neat block diagram explain the software development tools used for designing DSP system. **[3]**

Q8) a) Explain Wavelet algorithm in brief. **[4]**

b) Explain Practical DSP Applications Audio Coding and Audio Effects. **[3]**

c) Explain any one adaptive filtering algorithm. **[3]**

Total No. of Questions : 8]

SEAT No. :

P4141

[Total No. of Pages : 3

[5255] - 639

M.E. (E & TC) (VLSI & Embedded Systems)

FAULT TOLERANT SYSTEMS

(Semester - III) (2013 Pattern) (604201) (Credit System)

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) Define unknown logic value. Construct the truth table for 2 input NAND gate. Prove that there is a loss of information associated with the use of 3-valued logic. **[5]**

b) Explain main flow of Event driven simulation. **[5]**

Q2) a) Explain following delay models for 2 input AND gate with timing diagrams,

i) Rise and Fall delay

ii) Transport delay

iii) Inertial delay **[5]**

b) Explain 8 valued logic for static and dynamic hazard analysis. Calculate AND (R, 1*). **[5]**

Q3) a) Calculate equivalent collapse ratio and dominance collapse ratio for the circuit shown in Fig. 1. **[5]**

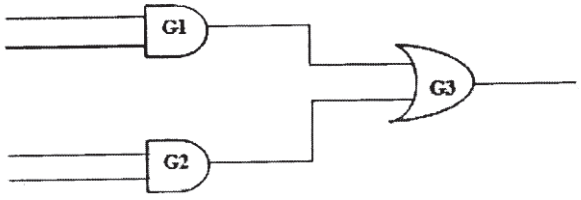


Fig.1

b) Construct the truth table of an XOR function of two inputs using five composite logic values. **[5]**

P.T.O.

Q4) a) Find fault list at J by considering faults B/1, F/0, J/0 for inputs shown in Fig.2 using deductive fault simulation. **[5]**

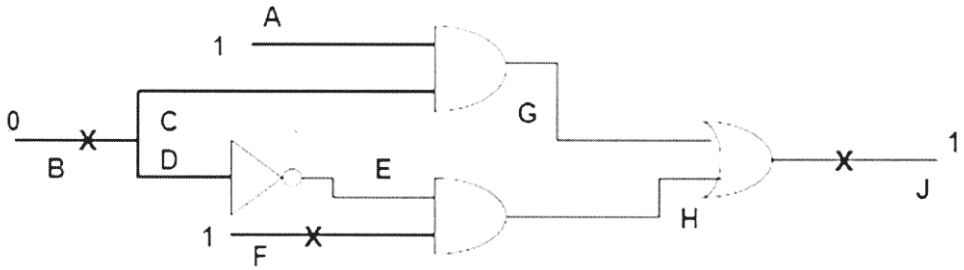


Fig.2

b) For the circuit shown in Fig. 3, **[5]**

- find the set of all tests that detect the fault c s-a-1
- find the set of all tests that detect the fault {c s – a – 1, a s – a –1}

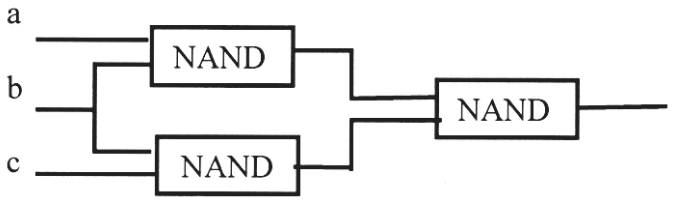
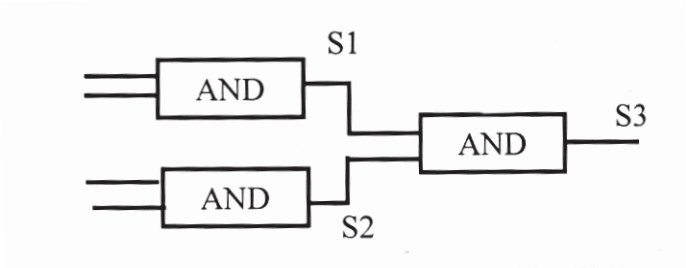


Fig.3

Q5) a) Obtain the Berger code for three information bits (I). **[5]**

b) Prove that for the following circuit, Syndrome S3 = S1*S2. **[5]**



Q6) a) Prove that residue m must be odd for the Residue coed to detect single bit error. **[5]**

b) What are the properties of LFSRs that make them suitable for generation of pseudorandom code in signature analysis. **[5]**

Q7) a) Explain different test pattern generation methods for BIST. **[5]**

b) Explain following Ad Hoc design for testability techniques. **[5]**

- Initialization.

- Monostable Multivibrators.

Q8) a) Give classification of BIST techniques. **[5]**

b) What is crosspoint fault? Explain different types of crosspoint faults occurred in PLA. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4142

[Total No. of Pages : 3

[5255]-640

M.E. (E & TC) (VLSI and Embedded Systems)
ASIC DESIGN
(2013 Pattern) (Semester-III) (604202)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Explain in brief the combinational and sequential modelling with an example. **[4]**

b) What is ASIC library? What is need of library? **[3]**

c) Discuss the economics of using ASICs in a product. **[3]**

Q2) a) Explain the various steps in ASIC design. **[4]**

b) Write a VHDL code for a sequence detector, which detects the sequence '10101' using Mealy Machine. **[4]**

c) Differentiate between channelled and channel less Gate Array. **[2]**

Q3) a) What is mean by Gate Level Simulation? **[4]**

b) What is cross talk noise in context of ASIC design? How it can be avoided? **[4]**

c) Explain the different timing parameters used for Static Timing Analysis. **[2]**

P.T.O.

Q4) a) What is mean by signal integrity problem? How to overcome it? **[4]**

b) What are the different testing approaches for mixed signal Analogue and Digital circuits? **[3]**

c) Explain signal integrity effects in ASIC design. **[3]**

Q5) a) What are different objectives of system partitioning and explain different algorithms used for the same. **[4]**

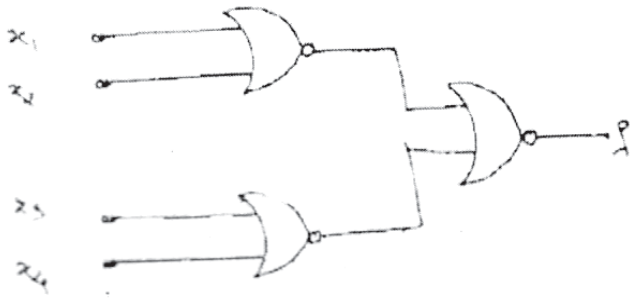
b) What is force directed placement algorithm? Explain different force directed placement algorithms. **[3]**

c) What are the different approaches for global routing? **[3]**

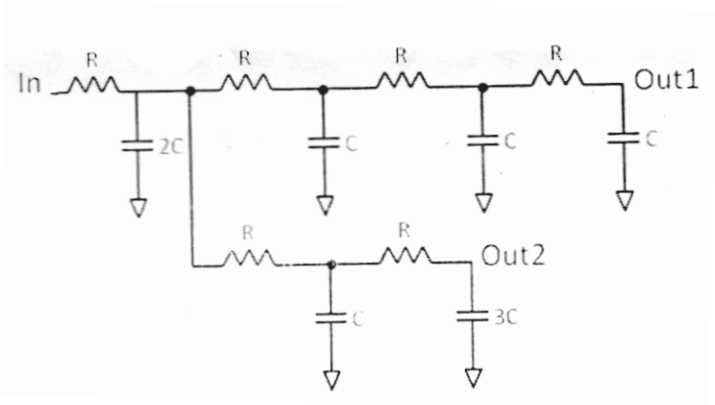
Q6) a) What is system partitioning? Explain any one algorithm used for system partitioning? **[4]**

b) Differentiate pre layout and post layout simulation with respect to ASIC. **[3]**

c) Classify fault Model. Find the Test Set for the Circuit Shown in Fig. 1. to find the maximum fault coverage. **[3]**



Q7) a) Consider the RC network given below: **[5]**



i) Calculate the Elmore's delay from In to Out 1 and from In to Out 2. Which one is critical path?

ii) Assume R = 100Ω and C = 10fF, Calculate the Elmore's delay of the critical path you find in part 1.

b) Explain the ASIC verification and its issues. Write the features of any four EDA tools. **[5]**

Q8) a) Write short notes on (any two): **[5]**

i) Design Reuse

ii) Simulation

iii) Controllability and Observability

b) Explain the Boundary Scan Test. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4143

[Total No. of Pages : 2

[5255]-641

M.E. (Electrical Control Systems)

COMP. TECH. IN CONTROL SYSTEMS

(2013 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answers Qu 1 or 2, Qu 3 or 4, Qu 5 or 6, Qu 7 or 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Explain what do you understand by Lagrange Function. **[9]**

OR

Q2) Use analytical method to investigate for extremum point **[9]**

$F(x) = -3x^4 + 10x^3 - 20.$

Q3) Explain what do you understand by Multivariable Optimization with no constraint. Write necessary and sufficient condition. **[9]**

OR

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

$$F(x) = 0.5k_2x_1^2 + 0.5k_3(x_2 - x_1)^2 + 0.5k_1x_2^2 - P\,x_2$$ **[9]**

Q5) Explain method of conversion of non serial system to serial system problem. **[16]**

OR

Q6) a) Explain the concept of suboptimization and principle of optimality used in multistage decision problem. **[8]**

b) Explain method of conversion of non serial system to serial system problem. **[8]**

P.T.O.

Q7) a) Explain the step by step procedure of revised simplex method. **[8]**

b) Write the steepest descent method of optimization of a problem. **[8]**

OR

Q8) a) Explain the Gomory's cutting plane method. **[8]**

b) Explain the integer nonlinear programming. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P4144

[Total No. of Pages : 2

[5255]-642

M.E. (Electrical - Control System)
PROCESS CONTROL MANAGEMENT
(2013 Course) (Semester-I) (503102)

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) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) Write short note on Motivation and Leadership in process control management. **[6]**

b) What are the essential needs for a control system to be satisfied? **[6]**

c) Explain Zigler-Nichols closed loop method for tunning in detail. **[6]**

OR

Q2) a) With suitable example explain that conflict is necessary for organizational activity. **[6]**

b) Describe with appropriate diagram, liquid level control in process industry. **[6]**

c) Explain Process reaction curve for the control system. **[6]**

Q3) a) Give the steps to develop a discrete time model from its equivalent continuous time model. **[8]**

b) Explain cascade control system for Continuous Stirred Tank Reactor. **[8]**

OR

Q4) a) Compare P, PI, and PID control action in detail. **[8]**

b) Draw a block diagram of Feedback control system & for each component write transfer function relating its output to input. **[8]**

P.T.O.

Q5) a) Define Relative Gain Array (RGA). Give its significance. **[8]**

b) Explain the effect of interaction on stability of process control system. **[8]**

OR

Q6) a) What is one way decoupling of two control loops? Why it could be acceptable? **[8]**

b) Explain interaction of control loops in a stirred tank heater for temperature control with suitable diagram. **[8]**

Total No. of Questions :6]

SEAT No. :

P4145

[Total No. of Pages :2

[5255] - 643

M.E. (Electrical) (Control System)

NON LINEAR CONTROL SYSTEM

(2013 Credit Pattern) (Semester - I)

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) ***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 characteristics of non - linear system. **[4]**

b) State and explain various singular points present in non linear systems. **[6]**

c) Consider a system with an ideal relay as e = $\pm$ M and system equation G(s) =1/S^2 with unity feedback. Determine singular points and construct phase trajectories by isoclines method, considering initial conditions: e (0) =2,de/dt(0) = 1.Take ref input =2 & M =1.2. Comment on stability. **[8]**

OR

Q2) a) Explain Describing Function method for stability analysis of non - linear systems. **[4]**

b) Derive Describing Function of saturation non - linearity. **[8]**

c) Construct phase trajectory by delta method for a non - linear system represented by: $\ddot{X} + 4\dot{X}|\dot{X}| + 4X = 0$. Choose initial conditions as: X(0) = 1.0 & $\dot{X}(0) = 0$. **[6]**

P.T.O.

Q3) a) Explain 'Stability' according to Lyapunov. Define 'Asymptotic' & 'Local' 'Global'Stability'. **[8]**

b) Consider spring-mass damper system with governing equations:

$\ddot{X} + B\dot{X} + KX = 0.$ Prove that rate of change of energy is given by: **[8]**

$$V \text{ dot } (X_1, X_2) = - BX^2$$

OR

Q4) a) Consider non linear system described by:

$$\dot{X}_1 = X_2 - X_1\left(X_1^2 + X_2^2\right)$$

$\dot{X}_2 = -X_1 - X_2\left(X_1^2 + X_2^2\right)$. Comment on stability using Lyapunov stability criteria. **[8]**

b) Explain generation of Lyapunov function by using Krasovskii method. **[8]**

Q5) Write a short note on: **[16]**

a) Feedback Linearization.

b) Input - Output Linearization.

OR

Q6) Explain steps involved in Input-Output linearization and input state linearization for the system: **[16]**

$$\dot{X}_1 = X_1^2 + 2X_2 + 4$$

$$\dot{X}_2 = X_1 + 4$$

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Total No. of Questions : 6]

SEAT No. :

P4146

[Total No. of Pages : 2

[5255] - 644

M.E. (Electrical) (Control Systems / Power Systems / Power Electronics and Drives)

RESEARCH METHODOLOGY

(2013 Credit Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6.***
2) ***Assume suitable data, if necessary.***

Q1) a) Explain clearly with examples the difference between applied and fundamental research. **[5]**

b) Explain the features of good research design. **[4]**

c) What are the different parameters of measurement of asymmetry of data? **[5]**

d) What do you understand by critical literature review? **[4]**

OR

Q2) a) Explain the significance of research. **[5]**

b) Explain the difference between collection of data through questionnaire and schedule. **[4]**

c) Explain the following concepts related to research design : **[5]**

i) Dependent and independent variable.

ii) Extraneous variable.

d) What are the techniques involved in defining a research problem? **[4]**

Q3) a) Write short notes on : **[8]**

i) Bibliography and its importance.

ii) Significance of footnotes while writing thesis.

b) Explain the difference between technical report and thesis. **[8]**

OR

P.T.O.

Q4) a) Explain the features of LATEX used for preparing technical report. **[8]**

b) Explain the technique and importance of oral presentation of research findings. **[8]**

Q5) Explain the following types of papers to report the research work. **[16]**

a) Journal Paper.

b) Survey Paper.

c) Poster Paper.

d) Review Paper.

OR

Q6) a) Write short note on Patent and trademark. **[6]**

b) Explain the various steps involved in preparation of a research proposal. **[10]**

Total No. of Questions :6]

SEAT No. :

P4147

[Total No. of Pages : 2

[5255]-645

M.E. (Electrical) (Control System)

MULTIVARIABLE AND OPTIMAL CONTROL SYSTEM

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right 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 any two multivariable control systems. **[4]**

b) Explain controllability and observability of multivariable control system. **[5]**

c) Discuss in short the pole allocation using linear state variable feedback in multivariable control system. **[4]**

d) Explain the factors to be considered in formulation of an optimal control problem using quadratic performance criterion. **[5]**

OR

Q2) a) Explain for multivariable control system

i) Differential operator form

ii) Transfer matrix form

iii) State space form **[4]**

b) Find observability and controllability of system given by **[5]**

$$A=\begin{bmatrix}1 & 0 & 1\\ 2 & 1 & 0\\ 0 & 1 & 2\end{bmatrix} \quad B=\begin{bmatrix}1 & 1\\ 1 & 0\\ 0 & 1\end{bmatrix} \quad C=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 1\end{bmatrix}$$

c) Explain clearly Model matching control design aspect of multivariable control system. **[4]**

d) Discuss various factors on which design of optimum controller depends. **[5]**

P.T.O.

Q3) a) State and explain Pontryagin's minimum principle. **[8]**

b) State the merits and demerits of optimal control. **[8]**

OR

Q4) a) Consider the linear time invariant first order system $\dot{x}(t)=u(t)$, using Hamiltonian method, find optimal control $u^*(t)$ which minimizes the performance Index

$$J=x^2(1)+\frac{1}{2}\int_0^1 u^2 dt$$

Given $x(0) = 0$ $x(1) = 1$ **[8]**

b) Define Hamiltonian. Derive state, co-state and control equations. **[8]**

Q5) Explain in detail the bang-bang control strategy. State it's advantages and limitations. **[16]**

OR

Q6) a) Find Optimal control input for system

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}1 & 1\\ 1 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}1\\ 0\end{bmatrix}u(t)$$

which will transfer state from initial state to final state in minimum time. **[8]**

b) Explain in detail minimum time problem. **[8]**

Total No. of Questions :8]

SEAT No. :

P4148

[Total No. of Pages :3

[5255] - 646

M.E. (Electrical) (Control Systems)

SYSTEM IDENTIFICATION & ADAPTIVE CONTROL

(2013 Pattern) (Semester - II) (503108)

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, Q. 7 or Q. 8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) How a system is identified using following methods? **[6]**

i) Spectral Analysis.

ii) Co - relation Analysis.

b) Compute QR factorization of the matrix? **[4]**

$$A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$$

OR

Q2) a) For a model given by $Y = \phi\theta$, derive the least square estimates of θ. Also determine the least square estimates of the parameter 'b' for a model given by Y(t) = b. Discuss the result? **[6]**

b) Write the note on persistency exciting signals? Any two. **[4]**

Q3) a) What are the various models structures used for system identification. What is the criterion for choosing a particular structure? **[6]**

b) Explain how learning is done in a redundant computer configuration? **[2]**

OR

P.T.O.

Q4) Write a notes on : (Any two) **[8]**

a) Pattern recognition.

b) Recursive estimation.

c) Learning without supervision.

d) Bayesian learning.

Q5) a) Explain with the help of block diagram the working of a self - tuning regulator? **[8]**

b) What is the need for adaptive control? How should one choose a suitable adaptive scheme? **[8]**

OR

Q6) a) Explain various adaptive schemes & how they are implemented? **[8]**

b) Explain the pole placement design & derive the Diophantine equation? **[8]**

Q7) a) Derive the MIT rule & explain the sign - sign algorithm. Why the choice of adaption gain is important? **[6]**

b) Consider the position servo describe by ;

$\frac{dv}{dt} = -a_v + b_u$ & $\frac{dy}{dt} = v$, where a & b are unkown.

Assume the control law.

$u = \theta_1 (u_c - y) - \theta_2 v$ is used. That is desired to control the system in such a way that the transfer function from command signal to process output is given by $G_m(s) = \frac{w^2}{s^2 + 2\xi w_5 + w^2}$.

Determine an adaptive control law that adjusts the parameters so that the desired objective is obtained. **[10]**

OR

Q8) Using MIT cule & Liapunov theory, design as MRAS for a system describes by;

$G(s)=\frac{b}{s+a}$ where a & b are unknown. The controller is given by

$u(t)=\theta_1 u_c(t)+\theta_2 y(t)$ & desired closed loop model is

$\frac{dym}{dx}=-a_m y_m+b_m U_c$.

Draw the simulation diagram & compare the two methods.

$$v(\theta)=\frac{1}{2}\left[e^2+\frac{1}{by}(b\theta_2+a-a_m)^2+\frac{1}{by}(b\theta_1-b_m)^2\right].$$ **[16]**

☼ ☼ ☼

Total No. of Questions : 3]

SEAT No. :

P4149

[Total No. of Pages : 2

[5255]-647

M.E. (Electrical - Control System)
ADVANCED DIGITAL CONTROL TECHNIQUES
(2013 Course) (Semester-II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer all questions.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Assume suitable data if necessary.***

Q1) Solve any three: **[18]**

a) Explain with respect to Digital system:

i) Closed form solution of G (T)

ii) Partial matching of states

b) Elaborate digital modeling with sample and hold devices. What are the important considerations while selecting the value of sampling period?

c) Explain decimation and interpolation process with the help of spectral analysis.

d) Explain how stability can be improved by state feedback?

Q2) Solve any two: **[16]**

a) What are the advantages of TMS 320C54X?

b) State and explain key features of TMS 320 C5X processor.

c) Explain finite word length effect in digital filters.

d) Give the applications of TMS 320 typical DSP processors.

P.T.O.

Q3) Solve any two: **[16]**

a) What is fixed point and floating point DSP? Explain in detail.

b) Design FIR filter by Fourier Series Method.

c) Give functional block diagram of TMS 320C54X processor and explain it.

d) Explain instruction set of TMS 320C54X DSP.

Total No. of Questions :6]

SEAT No. :

P4150

[Total No. of Pages :2

[5255] - 648

M.E. Electrical (Control System)

ADVANCED DRIVES AND CONTROL

(2013 Credit Pattern) (Semester III) (603101)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figure to the right indicate full marks..***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain multiquadrant operation of en electrical hoist in detail. **[4]**

b) Draw a neat diagram of the system model and derive the transfer function of converter fed dc drives. **[4]**

c) Write short note on current source inverter fed variable frequency induction motor drive. **[5]**

d) Write a note on direct torque control of three phase induction motor drive. **[5]**

OR

Q2) a) Compare AC and DC drives **[4]**

b) Discuss closed loop control of converter fed dc motor drive. **[5]**

c) Explain variable frequency control of three phase induction motor drive with its speed torque characteristics. **[4]**

d) Write a note on sensor less vector control of three phase induction motor drive. **[5]**

P.T.O.

Q3) Compare

a) Sinusoidal SPM machine drives and trapezoidal SPM machines drives **[8]**

b) Wound field machine drives and switched reluctance motor drives. **[8]**

OR

Q4) a) Discuss synchronous reluctance concept of synchronous motor drives. **[8]**

b) Obtain dynamic d-q model of synchronous motor drives. **[8]**

Q5) a) Write a note on modern trends in electric drives control. **[8]**

b) Write a detail note on industrial application of PID controller. **[8]**

OR

Q6) a) Explain the application of phase locked loop in the closed loop control of electric drive. **[8]**

b) Write a detail note on design procedure of current control in a closed loop control of electric drive. **[8]**

Total No. of Questions : 6]

SEAT No. :

P4151

[Total No. of Pages : 2

[5255]-649

M.E. (Electrical Control System)

COMPUTER AIDED CONTROL SYSTEM DESIGN

(2013 Course) (Semester-III) (603102)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain the computer method for determining the controllability and observability of control system. Draw the flow chart and give its algorithm. **[6]**

b) Derive the transfer function of the following compensator networks and draw the corresponding Bode diagrams. **[6]**

i) Phase - lag network

c) Explain the importance of computer as an aid in the analysis and design of control system. **[6]**

OR

Q2) a) Explain the computer method for obtaining the solution of state and output equations of a closed - loop control system represented by **[8]**

$$\dot{x}(t) = \mathrm{A}\,x(t) + \mathrm{B}\,u(t)$$
$$y(t) = \mathrm{C}\,x(\mathrm{t})$$

With usual notation. Give its algorithm.

b) Draw the block diagram of observer system and explain with the designing steps of full order observe. **[4]**

c) Explain clearly terms 'Absolute stability' and 'Relative stability'. Explain the measures of relative stability using polar plot and bode diagrams. **[6]**

P.T.O.

Q3) a) Explain with diagram the working of P, PI and PID controller. **[8]**

b) Explain step by step the design procedure of tunable PID controller using Ziegler-Nichols method. Give its algorithm. **[8]**

OR

Q4) a) Explain with algorithm the computer method of design of PID controller using Ziegler-Nichols method. State the limitations of this method. **[8]**

b) Consider a process control system with plant transfer function

$$G_p(s) = \frac{30}{s^3 + 11s^2 + 36s + 36}$$

Design a PID controller for this system using Ziegler-Nichols method. **[8]**

Q5) a) Draw the block diagram of a typical digital control system and explain clearly the working of each block. What is the effect of sampling period 'T' on the stability of the system? **[8]**

b) Consider the system $x(k+1) = Gx(k) + Hx(k)$, where $G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix}$, $H = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$. Determine a suitable state feedback gain matrix K such that the system will have the closed loop poles at z = 0.5 + j0.5, z = 0.5 - j0.5. **[8]**

OR

Q6) a) Discuss the advantages of digital controller over continuous time controller, also explain the problems in implementing digital control system. **[8]**

b) A discrete time control system is represented by the differential equation $x(k+1) = Fx(k) + Gu(k)$. Where k is the sampling instant, $x(k)$ is n x 1 state vector, $u(k)$ is m s 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]**

Total No. of Questions : 3]

SEAT No. :

P4152

[Total No. of Pages : 2

[5255]-650

M.E. (Electrical) (Power Systems)

COMPUTER APPLICATIONS IN POWER SYSTEMS

(2013 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) Solve any THREE **[18]**

a) Explain Lagrange's multiplier method for optimization with equality constriants.

b) Minimize $f(x) = x_1^2 + x_2^2 - 2x_1 + x_1x_2 + 1$ using classical optimization method.

c) Explain contingency analysis and security monitoring used in power system analysis.

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) Incremental fuel costs in rupees per MWh for plant consisting two units are $\frac{\partial F1}{\partial P_{g1}} = 0.20P_{g1} + 40$ and $\frac{\partial F2}{\partial P_{g2}} = 0.0P_{g2} + 30$

Generator limits are $30MW \le P_{g1} \le 175MW$ and $20MW \le P_{g2} \le 130MW$

Determine total load and load shared by each generator if incremental cost is

(i) $\lambda = 50$,

(ii) $\lambda = 75$,

(iii) $\lambda = 77$

c) Explain classical economic load dispatch with algorithm considering limits.

Q3) Solve any TWO **[16]**

a) Derive general formula of fault current and fault voltage for LG type fault.

b) Derive transmission loss coefficient using sensitivity factor.

c) Derive B-coefficient formula used in economic dispatch.

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Total No. of Questions : 5]

SEAT No. :

P4153

[Total No. of Pages : 2

[5255]-651

M.E. (Electrical - Power Systems)
POWER SECTOR ECONOMICS AND MANAGEMENT
(2013 Course) (Semester-I) (503202)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) Attempt any three of the following: **[18]**

a) Explain role of Planning Commission and Central Electricity Authority.

b) For a power project initial investment of Rs. 15 lacs is required. The annual returns for six years are Rs. 2 lacs, Rs. 2 lacs, Rs. 3.5 lacs, Rs. 4 lacs, Rs. 5 lacs and Rs. 5.5 lacs respectively. Taking discounting factor of 15% calculate net present value of the project. Will this project will be economical?

c) What provisions are made in tariff to take care of natural calamities? Also explain term Gold Plating in restructuring.

d) Discuss ISO models.

e) Explain principles of tariff setting.

f) Explain hidden costs in regulations.

Q2) a) Discuss market settlement process. Also explain factors affecting settlement process. **[8]**

b) Explain dispatch based pricing and power flow based pricing methods. **[8]**

OR

P.T.O.

Q3) a) Share experiences of restructured power industry from UK and Nordic pool. **[8]**

b) Explain with suitable examples Spot pricing, Constraint spot pricing for active and reactive power. **[8]**

Q4) a) What is congestion? Discuss various reasons for congestion in power network. **[8]**

b) What are ancillary services? Explain in detailed ancillary service auction. **[8]**

OR

Q5) a) Explain transmission pricing model adopted in India? **[8]**

b) Explain: **[8]**

i) Arbitrage in power system.

ii) Effect of transmission planning in unbundled system.

Total No. of Questions :6]

SEAT No. :

P4154

[Total No. of Pages :2

[5255] - 652

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

$$[P] = \begin{bmatrix} k_d\cos\theta & k_q\sin\theta & k_o \\ k_d\cos\left(\theta - \frac{2\pi}{3}\right) & k_q\sin\left(\theta - \frac{2\pi}{3}\right) & k_o \\ k_d\cos\left(\theta + \frac{2\pi}{3}\right) & k_q\sin\left(\theta + \frac{2\pi}{3}\right) & k_o \end{bmatrix}$$

$$\left(\text{where } K_d = K_q = \sqrt{2/3} \text{ and } K_0 = \sqrt{1/3}\right)$$

Q1) a) Derive the mathematical model of hydraulic turbine and state assumptions involve in it clearly. **[9]**

b) A synchronous machine is having one damper winding on d - axis and two damper windings on q - axis. Derive the stator voltage equations in dq0 frame of reference for this machine. Write down assumptions involve in it. **[9]**

OR

Q2) State and explain various types of transformers used in power system and then develop a mathematical model of phase shifting transformer. **[18]**

P.T.O.

Q3) Explain with the help of suitable block diagram or line diagram, working of any two types of excitation control system of alternator. **[16]**

OR

Q4) Discuss the significance of voltage regulator in power system. Explain with the help of suitable block diagram, the working of electromechanical voltage regulators. **[16]**

Q5) What is the significance of load modeling in power system? Write down various types of load modeling with their assumptions and approximations involved in it. Explain any one example of dynamic load modeling. **[16]**

OR

Q6) State and explain basic types of static voltage compensators (SVCs) with the help of equivalent circuit diagrams. Draw their operating characteristics. **[16]**

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Total No. of Questions : 6]

SEAT No. :

P4155

[Total No. of Pages :2

[5255] - 653

M.E. (Electrical)

(Power Systems)

POWER SYSTEM DYNAMICS

(2013 Pattern) (Semester - II) (503207)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Solve Total Three questions. Answer any One from Q1 and Q2. Answer 1 question from Q3 or Q4, and Q5 or Q6 each.***
2) ***Assume suitable data if necessary.***
3) ***Write down all the assumptions made.***

Q1) Draw the diagram representing synchronous generator by model 1.1 and derive stator voltage equations for it. **[18]**

Q2) A non salient pole generator is connected to an infinite bus through an external reactance (X_e) of 0.5 p.u. The field voltage is adjusted such that the terminal voltage is 1.0 p.u., when the power output is 1.0 p.u.

a) What is the expression for power (P_g) as a function of δ in steady state?

b) What is the maximum power supplied in steady state?

c) What is the maximum power supplied in transient state?

(Assume X_d=1.0, X'_d=0.5, E_b=1.0) **[6 + 6 + 6 = 18]**

Q3) 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

P.T.O.

Q4) Derive an expression for small signal analysis of multi-machine system considering simplified model of synchronous machine. State any assumption made. **[16]**

Q5) Explain with the help of generator, infinite bus and load bus the concept of voltage stability. Draw system diagram and appropriate characteristics to explain effect change in load on voltage stability. **[16]**

OR

Q6) a) Explain with the help of suitable example, the objectives and various methods of islanding. **[10]**

b) Discuss assumptions involved in transient stability analysis of multi machine system. **[6]**

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Total No. of Questions :5]

SEAT No. :

P4156

[Total No. of Pages :1

[5255] - 654

M.E. (Electrical) (Power System)

POWER SYSTEM PLANNING & RELIABILITY

(2013 Pattern) (Semester - II) (503208)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Q1 is compulsory, Solve Q2 or Q3, Solve Q4 or Q5.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) Solve any three. **[18]**

a) Explain method of peak load forecasting and reactive load forecasting

b) Explain Binomial Distribution in details.

c) Explain Markov process and its application in reliability analysis.

d) Explain integrated resource planning.

Q2) a) What do you mean by composite system reliability? Explain in detail the data required for composite system reliability. **[9]**

b) What are the objectives of transmission planning? **[7]**

OR

Q3) a) Explain the procedure and steps for transmission system planning. **[9]**

b) Describe the factors affecting transmission system planning. **[7]**

Q4) a) Explain the effects of lateral distribution and disconnect in distribution system. **[10]**

b) Explain basic reliability evaluation techniques for parallel network. **[6]**

OR

Q5) a) Explain the effects of protection failure and transferring loads in distribution system. **[10]**

b) Explain interruption indices in distribution system reliability evaluation. **[6]**

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Total No. of Questions : 5]

SEAT No. :

P4157

[Total No. of Pages : 2

[5255]-655

M.E. (Electrical) (Power System)
HVDC AND FLEXIBLE AC TRANSMISSION
(2013 Course) (Semester-II) (503209)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of Calculator is allowed.***
4) ***Assume Suitable data if necessary.***

Q1) Solve any THREE: **[18]**

a) Explain working principle, V-I characteristics & control schemes of TCSC.

b) Explain the operation and function of UPFC with a block diagram.

c) Compare the advantages & disadvantages of HVDC system over HVAC system.

d) Explain CC control for HVDC link.

e) Explain the working of static synchronous series compensator (SSSC).

f) What are the different dc link converter topologies. Explain any one in detail.

Q2) a) Compare HVDC light and HVDC transmission system. **[8]**

b) What are the controls in VSC DC system implemented. **[8]**

OR

Q3) a) Explain the details of HVDC system with functions of different components. **[8]**

b) Explain the importance of HVDC grounding & how it is achieved in practice? **[8]**

P.T.O.

Q4) a) Write about multi terminal HVDC systems configurations. **[8]**

b) Explain the principle & operation of VSC (Voltage Source Converter) of HVDC transmission. **[8]**

OR

Q5) a) Write about the different existing HVDC links and proposed links in India. **[8]**

b) Explain the HVDC protection schemes used against over voltages. **[8]**

Total No. of Questions : 6]

SEAT No. :

P4158

[Total No. of Pages :2

[5255] - 656

M.E. (Electrical) Power System

ADVANCED POWER SYSTEM PROTECTION

(2013 Pattern) (Semester - III) (603201)

Time : 3 Hours] *[Max. 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) Draw block diagram of numerical relay. State function of each block. **[6]**

b) State and explain sampling theorem. **[3]**

c) Explain digital protection of UHV transmission line based upon travelling ware using amplitude comparison relaying scheme. **[9]**

OR

Q2) a) Explain digital protection of synchronous generator based upon injection of sub - synchronous component in stator ckt. **[9]**

b) Explain gas actuated (Bucholtz) relay used for transformer protection. Explain gas analysis. **[9]**

Q3) a) Explain in detail, setting of three zones of a Three zone distance relay. **[12]**

b) State salient features and applications of computer graphics. **[4]**

OR

Q4) a) Explain three stepped distance protection of transmission line. **[10]**

b) Write a note on integrated operation of national power system. **[6]**

P.T.O.

Q5) a) What is the necessity of s.c. studies of a power system? State assumptions made for conducting s.c. studies of a power system. **[8]**

b) Explain pc based integrated software features used in s.c. studies. **[8]**

OR

Q6) a) With all necessary equations, derive algorithm for s.c. studies. **[8]**

b) Using algorithm for s.c. studies, derive algorithm for calculating system conditions after the occurence of following faults **[8]**

i) 3 - phase to ground through fault impedance.

ii) Line to line fault through fault impedance.

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Total No. of Questions : 5]

SEAT No. :

P4159

[Total No. of Pages : 2

[5255]-657

M.E. (Electrical Power Systems)

POWER QUALITY ASSESSMENT & MITIGATION

(2013 Course) (Semester-III) (603202)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Neat diagrams must be drawn whenever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) Attempt any three: **[18]**

a) How different power quality event are classified and characterised?

b) Explain various causes of switching over voltages. How these can be controlled.

c) What are voltage sag limits for computer equipments? Explain with suitable diagram CBEMA and ITI curves.

d) Explain detailed harmonics produced by power electronic drives. What is the effect of delay angle and extinction angle on harmonic generation. Also mention effect of firing a symmetry on harmonic generation.

e) Discuss various methods for controlling harmonics without using filters.

Q2) a) What is the importance of power quality monitoring? What special requirements in power quality monitoring. **[8]**

b) For harmonic monitoring explain in detailed about selection of transducers, monitoring requirements. **[8]**

OR

Q3) a) Explain different approaches used in power quality monitoring. **[8]**

b) With reference to monitoring of sags or dip what are the system and monitoring requirements? **[8]**

P.T.O.

Q4) a) Explain different indices used for assessment of harmonics and ill effects of harmonics, and other power quality attributes. **[8]**

b) Explain measures used in industries to minimize power quality problems. **[8]**

OR

Q5) a) Give highlights of IEEE 51g for harmonic control. Also describe standards used for Sag and Swell measurement. **[8]**

b) What is harmonic state estimation? Explain capabilities of harmonic state estimation. **[8]**

Total No. of Questions : 5]

SEAT No. :

P4160

[Total No. of Pages : 2

[5255]-658

M.E. (Electrical) (Power Electronics & Drives)

MODELING AND ANALYSIS OF ELECTRICAL MACHINES

(2013 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Discuss the primitive machine model of dc machine and derive voltage equations. **[9]**

b) Discuss and derive the transformations for currents between a rotating balanced 3-phase winding and rotating 2-phase winding. **[9]**

OR

Q2) a) Discuss the mathematical of three-phase induction motor and synchronously rotating reference frame. Use space phasor diagram to explain the model. **[9]**

b) Explain basic two-pole machine and how different machines like dc machine and induction machine can be explained as kron's machine model? **[9]**

Q3) a) Obtain an expression for instantaneous torque in a 3-phase, 4-salient pole synchronous machine fitted with amortisseurs. **[8]**

b) Explain armature mutual inductance of salient pole synchronous machine from a consideration of its basic parameters and derive its expression. **[8]**

OR

P.T.O.

Q4) a) Discuss the theory on armature mutual inductance of salient pole synchronous machine from a consideration of its basic parameters. **[7]**

b) Derive the Linearised model of Synchronous machine. **[9]**

Q5) a) Discuss small displacement stability and eigen values. **[8]**

b) Derive the Linearised model of Induction machine. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P4161

[Total No. of Pages : 2

[5255]-659

M.E. (Electrical - Power Electronics & Drives)

ENERGY MANAGEMENT AND POWER QUALITY IN ELECTRICAL DRIVES

(2013 Course) (Semester-I) (503302)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Solve Q. 1 or Q. 2, Q. 3 or Q. 4 and Q. 5 or Q. 6.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of Calculator is allowed.***
4) ***Assume Suitable data if necessary.***

Q1) a) What are symptoms of poor power quality? **[9]**

b) Write note on optimal selection of Pumps and Fans. **[9]**

OR

Q2) a) Write note on interharmonics. **[9]**

b) Explain capacitor size and location fixation criterion. **[9]**

Q3) a) Write detail note on different voltage variation indices. **[8]**

b) What is power quality state estimations? Elaborate the same. **[8]**

OR

Q4) a) Discuss various causes of voltage flicker? **[8]**

b) Discuss in detail various voltage regulation devices. **[8]**

P.T.O.

Q5) a) Write detail note on Power quality measuring equipment. **[8]**

b) Enlist the different power quality monitoring standards and explain them. **[8]**

OR

Q6) a) Explain objectives and consideration of power quality monitoring. **[8]**

b) Explain the application of intelligent system in power quality monitoring. **[8]**

Total No. of Questions :6]

SEAT No. :

P4162

[Total No. of Pages :2

[5255] - 660

M.E. (Electrical) (Power Electronics & Drives)

POWER CONVERTERS

(2013 Pattern) (Semester - II) (503303)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, and Q5 or Q6.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain with necessary diagrams and waveforms the operation of a single phase full controlled converter. Derive expression for average output power. **[10]**

b) Explain Single pulse width modulation and Sinusoidal pulse width modulation technique. **[8]**

OR

Q2) a) Explain six step voltage source inverter (180º) with necessary waveforms and derive line - line output voltage equation using Fourier series. **[10]**

b) A single phase full wave bridge converter is connected to RLE load. The source voltage is 230V 50Hz. The average load current is l0 A is continuous over working range. For R = 0.4 ohms and L=2m H, Compute firing angle delay for E = 120V and E = –120 V. **[8]**

Q3) a) Write a short note on classification of Resonant converters. **[8]**

b) What are the advantages and limitations of ZCS converter. **[8]**

OR

P.T.O.

Q4) a) With a neat diagram explain the working of Parallel loaded resonant half bridge dc - dc converter. **[8]**

b) Write a short note on Zero voltage and Zero current switching. **[8]**

Q5) a) What are the advantages and disadvantages of bidirectional control? Explain single phase bi-directional controller with R load. **[8]**

b) Draw a neat diagram explain the working of Single phase full wave AC voltage controller with R load. **[8]**

OR

Q6) a) Draw a neat diagram of a Single phase full wave ac voltage controller supplying RL load. Draw the waveforms of source voltage, load current and voltage across the thyristors.
Explain three phase AC voltage controller with necessary circuit diagram and waveforms. **[8]**

b) A single phase voltage controller feeds power to a resistive load of 3 ohms from 230V 50Hz AC supply Calculate **[8]**

i) Maximum value of average current

ii) Maximum RMS value of thyristor current

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Total No. of Questions :6]

SEAT No. :

P4163

[Total No. of Pages : 2

[5255]-661

M.E (Electrical) (Power Electronics and Drives)

AC & DC DRIVES

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6.***
2) ***Assume suitable data, if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain principle of field oriented control of induction motor. Compare DC motor control analogy with vector controlled induction motor. **[5]**

b) Explain regenerative braking of DC motor. Justify your explanation using torque speed curves. What is maximum braking speed? **[5]**

c) The speed of a 10 hp, 230 V 1200 rpm separately excited dc motor is controlled by a single phase full converter. The rated armature current is 38 and the armature resistance is 0.3 ohm. The ac supply voltage is 260 V. The motor voltage constant is 0.1823 V/rpm. Assume continuous armature current and ripple free. For firing angle α=30 degree and at rated motor current, calculate, motor speed and torque. **[8]**

OR

Q2) a) Explain the principle of vector control and its implementation for rotor flux oriented control. Justify your explanation with necessary phasor diagram and block diagrams. **[5]**

b) Discuss first quadrant operation of DC chopper fed series motor drives. Write all the expressions to justify the operation of the drive. **[4]**

c) Explain slip power recovery scheme for 3 phase induction motor. Discuss implementation diagram. **[4]**

d) Explain speed control of DC separately excited motor fed by 3 phase full converter. Discuss output waveforms, firing logic for power devices. **[5]**

Q3) a) Discuss the construction and operation of variable reluctance motor. Also discuss the control circuit and motor performance characteristics.**[8]**

P.T.O.

b) Explain on how the unidirectional torque is produced in brushless DC motor and Give different rotor position control circuits. **[8]**

OR

Q4) a) What is multi-stack stepper motor. Discuss its performance characteristics. **[8]**

b) Explain the modes of operation and speed control of switched reluctance drive. State the disadvantages of switched reluctance motor drive over other AC motor drives. **[8]**

Q5) a) Write the dynamic model of three phase induction motor in different reference frames. **[8]**

b) Write the dynamic model of DC separately excited motor and derive the transfer function for armature controlled separately excited DC motor. **[8]**

OR

Q6) a) From the modeling equation of DC motor, draw the closed loop system with reference input is armature voltage and speed is controlled output. Explain the closed loop control. **[8]**

b) Derive the transfer function of field controlled separately excited DC motor. Hence draw the control system diagram, mentioning transfer function of each block. **[8]**

Total No. of Questions :8]

SEAT No. :

P4164

[Total No. of Pages :2

[5255] - 662

M.E. Electrical (Power Electronics and Drives)

DESIGN OF POWER ELECTRONIC SYSTEMS

(2013 Pattern) (Semester - II) (503308)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any one from 1 & 2, 3 & 4, 5 & 6, 7 & 8.***
2) ***Neat diagrams to the right indicate full marks.***
3) ***Use of calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) Derive the mathematical modeling of N - IGBT. **[9]**

OR

Q2) Derive the mathematical modeling of Boost converter using circuit averaging method. **[9]**

Q3) a) Model a heat sink. **[4]**

b) AMOSFET used in step down inverter has an on - state loss of 50W and switching loss given by 10^{-3} fs(in W) where fs is the switching frequency in Hz. The junction to case thermal resistance Rθjc is 1ºC /W and the maximum junction temperature Pj max is 150ºC. Assuming the case temperature is 50°C, estimate the maximum allowable switching frequency. **[5]**

OR

Q4) Explain single Pass transformer design procedure with flowchart **[9]**

Q5) A 10 hp, 1700rpm, self excited dc motor, driven from a 120V, 60Hz source, has the following parameters: Ra = 0.02 Ω, La = 1 mH, R_f = 150 Ω, k_m = 0.5 N-m/A^2. k_e = 0.608 V/A.rad/sec. The field is separately energized by a full bridge rectified dc derived from the ac 120V, 60Hz source. The motor speed is to be varied from 10% to the rated speed at a constant torque. The maximum peak - to - peak torque ripple should not exceed 5% of the rated torque. Design an ac - dc converter for the motor. **[16]**

OR

P.T.O.

Q6) Explain the zero voltage switching technique in a Buck converter with necessary diagrams and waveforms **[16]**

Q7) a) Explain Turn off snubber with neat circuit diagrams and waveforms. **[8]**

b) Explain the need of isolation in power electronic circuits. Explain upto - coupler based isolation circuit. **[8]**

OR

Q8) a) Explain the requirement of Gate drive circuit. Explain any one gate drive circuit for MOSFET in detail. **[12]**

b) Explain the circuit layout considerations of Gate driver circuit. **[4]**

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Total No. of Questions : 4]

SEAT No. :

P4165

[Total No. of Pages : 2

[5255]-663

M.E. (Power Electronics and Drives)
ADVANCED CONTROL SYSTEMS
(2013 Pattern) (Semester-II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) What is an observer? What are the conditions under which the use of observer is found suitable? **[2]**

b) A system is given by **[4]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

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

Design a pole placement controller to place the poles at -6, -6.

c) Explain the minimum fuel and minimum energy problem. **[3]**

Q2) a) What are structured and unstructured uncertainties? Explain with an example. **[4]**

b) Explain Jacobian linearization with an example. **[5]**

OR

b) Explain feedback linearization with an example. **[5]**

P.T.O.

Q3) a) With respect to Sliding Mode Control, explain the reaching and sliding phase. In which phase is the system robust to uncertainties? **[5]**

b) Why chattering is observed in Sliding Mode Control? Explain any one technique to reduce chattering. **[5]**

c) Derive the expression of control input for all the reaching laws of a system given by $\dot{x} = \mathrm{A}\,x + \mathrm{B}\,u,\ y = \mathrm{C}\,x + \mathrm{D}\,u$. **[6]**

Q4) a) Find the transfer function of boost converter using switching or averaging model. **[5]**

b) Describe the control of solar system. **[5]**

c) With the help of diagram, explain distribution generation in detail. **[6]**

Total No. of Questions : 6]

SEAT No. :

P4166

[Total No. of Pages : 2

[5255] - 664

M.E. (Electrical) (Power Electronics & Drives)

POWER ELECTRONICS APPLICATIONS

(Semester - III) (2013 Pattern) (603301)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) What is the role of power electronics in power system in today's context. Explain any one application of power electronics in power system **[6]**

b) It is required to integrate solar PV system with the grid. List the issue that are required to be addressed while integrating Solar PV with the grid. **[4]**

c) To obtain dc voltage of 200KV from a three phase bridge rectifier operating with ignition delay angle of 45 degree and commutation overlap 10 degree. Calculate the necessary line voltage of rectifier transformer.**[4]**

d) Why there is need of compensation in power systems? How reactive power is controlled in electrical network? **[4]**

OR

Q2) a) Draw the block diagram and explain in brief the operation of wind energy system. **[4]**

b) Write short note on : Filters for harmonic elimination in HVDC system.**[4]**

c) What are the different power system components? Explain any two of them with their characteristics. **[4]**

d) Explain with a neat sketch and waveforms the SSSC type of series controller. **[6]**

P.T.O.

Q3) a) How an UPFC scheme can be implemented using two back to back voltage source converters? Also state its advantages over STATCOM. **[10]**

b) Compare characteristics of STATCOM and SVC. **[6]**

OR

Q4) a) With the help of neat circuit diagram and relevant waveforms explain the steady state operation of STATCOM. **[10]**

b) State the salient features of UPFC. **[6]**

Q5) a) Describe the application of power electronics in Induction heating techniques. **[8]**

b) Identify the various voltage disturbances likely to occur in power system operation. How can it be control using uninterrupted power supplies? Explain its working with the help of block diagram. **[8]**

OR

Q6) Explain the role of power electronics devices played in **[16]**

a) Illumination applications.

b) Hybrid vehicle system.

Total No. of Questions : 8]

SEAT No. :

P4167

[Total No. of Pages : 2

[5255]-665

M.E. (Electrical) (Power Electronics & Drives)
POWER ELECTRONICS IN SMART GRID
(2013 Pattern) (Semester-III) (603302)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Neat diagrams must be drawn whenever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***You are advised to attempt not more than questions.***
4) ***Your answers will be valued as a whole.***

Q1) a) Explain the concept and need of distributed generation and energy storage in smart grid system. **[5]**

b) What are the different quality issues arises in smart grid systems? **[4]**

OR

Q2) a) Describe various legal and organizational regulations with respect to power quality in smart grid systems. **[5]**

b) Write down different attributes of smart grid system. **[4]**

Q3) a) Explain high frequency devices commonly used in space applications. **[4]**

b) Write the status of distributed generation in past and future. **[5]**

OR

Q4) a) Describe the concept and importance of Micro grid. **[5]**

b) What are the issues of Interconnected Grid system? **[4]**

Q5) Write short notes on - **[16]**

a) Advanced Metering Infrastructure (AMI).

b) CLOUD computing.

OR

P.T.O.

Q6) Distinguish between following communication technologies. **[16]**

a) Home Area Network (HAN) and Wide Area Network (WAN).

b) Bluetooth and ZigBee.

Q7) a) Explain the use of AC/AC voltage regulator for compensation of voltage sag and swell. **[8]**

b) Explain operation of D-STATCOM along with decoupled current control method. **[8]**

OR

Q8) a) Explain voltage control scheme used with D-STATCOM. **[8]**

b) With a neat sketch explain dynamic static synchronous series controllers. **[8]**

Total No. of Questions : 8]

SEAT No. :

P4168

[Total No. of Pages : 3

[5255]-666

M.E. (I&C) (Process and Biomedical Instrumentation)
MATHEMATICAL METHODS IN INSTRUMENTATION
(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Assume suitable data if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***

Q1) a) Define orthonormal vector with suitable examples. **[2]**

b) If $\bar{u} = (-1,1,2)$, $\bar{v} = (2,-1,2)$ then find Euclidean inner product $< 2\bar{u} - 3\bar{v}, 3\bar{u} + \bar{v} >$ **[4]**

c) Find the norm of each vector and distance between vectors $\bar{u} = (1,1,2)$ and $\bar{v} = (1,4,-1)$. **[4]**

Q2) a) Let $\bar{v}_1 = (1,0,1)$, $\bar{v}_2 = (-1,1,0)$ be an orthonormal set of vectors in R^3, if $\bar{u} = (1,2,3)$ find orthogonal projection $\bar{u}$ on W and orthogonal component of $\bar{u}$ to W. **[5]**

b) Show that the set B = $(\bar{u}_1, \bar{u}_2, \bar{u}_3)$ where $\bar{u}_1 = (0,1,0)$ $\bar{u}_2 = (1,0,1)$ $\bar{u}_3 = (1,0,-1)$ is an orthogonal basis of R^3. **[5]**

Q3) a) Obtain Newton Raphson formula to find **[5]**

i) square root,

ii) r^{th} root of given numbers

b) Solve by Gauss-elimination method. **[5]**

$10x_1 + 2x_2 + x_3 = 9$

$2x_1 + 20x_2 - 2x_3 = -44$

$-2x_1 + 3x_2 + 10x_3 = 32$

P.T.O.

Q4) a) Determine the value of y when x = 1.4, by euler modified method given that $\frac{dy}{dx} = \log(x+y),\ y(1) = 2$ and $h = 0.2.$ **[5]**

b) The probability that a bomb dropped from a plane will strike the target is $\frac{1}{5}$. If six bombs are dropped, find the probability that exactly two will strike the target. **[5]**

Q5) a) A continuous random variable X has a probability density function given by $f(x) = 2e^{-2x},\ x \geq 0$. and $f(x) = 0,\ x < 0$. **[5]**

Find

i) Find moment generating function,

ii) The first four moment about origin.

b) Explain the terms Skewness and Kurtosis with suitable examples. **[5]**

Q6) a) A joint density function of two random variable X and Y is given by $f(x,y) = \frac{xy}{96}$,$0 < x < 4,\ 1 < y < 5$. and f(x ,y) = 0 , otherwise. **[6]**

Find

(i) E(X)

(ii) E(Y)

(iii) E(2X+3Y)

b) Explain the terms axioms of Probability. **[4]**

Q7) a) A firm has two cars which it hiers out day by day. The number of demands for a car on each day is distributed as a poissons variate with mean 1.5. Calculate probable number of day in year on which

i) neither car is in demand

ii) demand is refused. **[5]**

b) Let R^4 have a Euclidean inner product, Find the cosine of angle between the vectors $\overline{u}$ = (-1 ,2 ,3,4) and $\overline{v}$ = (4,1, 2,1). **[5]**

Q8) a) The first four moments of about the value 4 are –l.5, 17 , –30 and 108. Obtain first four central moments, mean standard deviation and coefficient of skewness and kurtosis. **[5]**

b) Find singular value decomposition of the matrix **[5]**

$$A = \begin{bmatrix} 2 & -1 \\ 2 & 2 \end{bmatrix}$$

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Total No. of Questions : 5]

SEAT No. :

P4169

[Total No. of Pages : 2

[5255]-667

M.E. (Instrumentation & Control) (Process Instrumentation)
TRANSDUCER DESIGN
(2013 Course) (Semester-I) (506102)

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 candidates indicate full marks.***
4) ***Use of electronic pocket calculator.***
5) ***Assume suitable data, if necessary.***

Q1) Attempt any two of the following:

a) Discuss importance of transducers. **[5]**

b) Explain inductive proximity sensors with its applications. **[5]**

c) With neat sketch explain different signal conditioning circuits used for conversion of capacitance in to voltage. **[5]**

Q2) Attempt any two of the following:

a) In detail explain signal conditioning circuit of strain gauge load cell for weight measurement with zero and span adjustments. **[5]**

b) Discuss signal conditioning circuit of Pt-100 RTD for temperature measurement with zero and span adjustments. **[5]**

c) Explain design of electromechanical sensor for level measurement. **[5]**

Q3) Attempt any two of the following:

a) Give design aspects of LVDT with its signal conditioning circuits and its importance. **[5]**

b) List different types of torque transducers and discuss any one in detail. **[5]**

c) Explain industrial applications of Chemical sensors. **[5]**

P.T.O.

Q4) Attempt any two of the following:

a) Give selection criteria for electromagnetic flowmeter. Also explain different types excitation used in it. **[5]**

b) Explain Nano sensors and its applications. **[5]**

c) Explain manufacturing process of MEMS with neat sketch. **[5]**

Q5) Attempt any two of the following:

a) List different Biosensors and explain each sensors application. **[5]**

b) List different Gas sensors and explain any two in detail. **[5]**

c) Explain LASER application in welding and cutting operations. **[5]**

Total No. of Questions :6]

SEAT No. :

P4170

[Total No. of Pages :2

[5255] - 668

M.E. (Instrumentation & Control) (Process Instrumentation)

INDUSTRIAL AUTOMATION

(2013 Pattern) (Semester - I) (506103)

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 calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Discuss in brief with suitable block diagram any two major components of the DCS. **[5]**

b) Explain working principle of HART protocol in detail. **[5]**

Q2) a) Enlist specifications of any typical PLC. **[5]**

b) Develop programmable ladder diagram for Flashing of lamp. **[5]**

Q3) a) The input sensor signal varies from 0 to 2.1 Amp. If the sensor signal exceeds 1.5 Amp yellow lamp must be turn on. Further, if the sensor signal is between 1.8 to 2.1 Amperes green lamp must go on. Develop programmable ladder diagram for the same. **[5]**

b) Explain with neat sketch famous automation hierarchy for an industrial application. **[5]**

Q4) a) Describe the data flow and number conversions involved in PLC analog operation. **[5]**

b) Give guidelines for designing of Field bus. **[5]**

P.T.O.

Q5) a) Explain with an example 'Sequential Function Chart'. **[5]**

b) Explain in brief calibration of Profibus. **[5]**

Q6) a) Explain in brief IEC61511 standard for functional Safety. **[5]**

b) Explain in brief architecture of safety instrumented system. **[5]**

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Total No. of Questions :6]

SEAT No. :

P4171

[Total No. of Pages : 2

[5255] - 669

M.E. Instrumentation & Control (Process Instrumentation & Biomedical)

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I)

Time : 3Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Solve any Five questions***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator.***
5) ***Assume suitable data if necessary.***

Q1) a) Discuss the scope of primary data in research. Also discuss features of questionnaire method. **[5]**

b) Elaborate guidelines for Writing individual research proposal. **[5]**

Q2) a) Define and bring out exact differences among.

i) Pure research and applied research.
ii) Qualitative and Quantitative research. **[5]**

b) Explain different types of variables used in research. **[5]**

Q3) a) Explain hypothesis testing with different types. **[5]**

b) Explain criteria of good research. **[5]**

Q4) a) Discuss Layout of the research proposal. **[5]**

b) Explain different steps in Writing research report. **[5]**

P.T.O.

Q5) a) Enlist different error source in research explain with example. **[5]**

b) Explain different plots to shows the performance curves in research study. **[5]**

Q6) a) How to estimate parameters? What are different methods for analyzing these parameters? **[5]**

b) In a class of 50 students, 10 have failed and their average of marks is 2.5. The total marks secured by the entire class were 281. Find the average marks of the students who have passed. **[5]**

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Total No. of Questions : 6]

SEAT No. :

P4172

[Total No. of Pages :2

[5255] - 670

M.E. (Instrumentation & Control) (Process Instrumentation)

ADVANCED PROCESS CONTROL

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) Develop mathematical model of surge tank from first principle. **[5]**

b) Explain design procedure of IMC for FOPDT process. **[5]**

Q2) a) What is the need of Modeling? **[5]**

b) Determine the RGA matrix for given process gain matrix K and comment on pairing of variables $K=\begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$. **[5]**

Q3) a) Explain with suitable example improvement in performance using cascade control system? **[5]**

b) Describe the process reaction curve method for identifying dynamic models. **[5]**

Q4) a) Derive relation for setpoint tracking and disturbance rejection for Feedforward control. **[5]**

b) Discuss in brief Interaction. **[5]**

P.T.O.

Q5) a) Discuss in brief dynamics of First order process to identify key performance characteristics. **[5]**

b) Explain in brief self tuning regulator. **[5]**

Q6) a) Explain design procedure of MRAS using MIT rule. **[5]**

b) Write a brief note on Inferential control. **[5]**

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Total No. of Questions :5]

SEAT No. :

P4173

[Total No. of Pages :2

[5255] - 671

M.E. (Instrumentation & Control) (Process Instrumentation)

EMBEDDED SYSTEM DESIGN

(2013 Pattern) (Semester - II) (506108)

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 candidates indicate full marks.***
4) ***Use of electronic pocket calculator.***
5) ***Assume suitable data, if necessary.***

Q1) Attempt any two of the following.

a) Explain different reset sources of A VR µC. **[5]**

b) Explain UART Receiver of A VR µC. **[5]**

c) Explain with suitable diagram ADC Prescaler of A VR µC. **[5]**

Q2) Attempt any two of the following.

a) Explain the ARM instruction Set for Embedded Systems. **[5]**

b) Discuss the Registers used in the ARM THUMB instruction set. **[5]**

c) Explain the Interfacing of GSM WITH ARM / ARM BOARD. **[5]**

Q3) Attempt any two of the following.

a) Describe I2 C Protocol? **[5]**

b) Explain with suitable diagram RS-485 Link. **[5]**

c) Compare between SPI vs. I2C. **[5]**

P.T.O.

Q4) Attempt any two of the following.

a) Describe the four primary benefits of CAN protocol provides. **[5]**

b) What are the Goals for the Universal Serial Bus. **[5]**

c) Explain CAN transceiver features. **[5]**

Q5) Attempt any two of the following.

a) What is the difference between a FPGA and an ASIC? **[5]**

b) Explain traditional FPGAs design flow. **[5]**

c) Explain sensors system based on FPGAs. **[5]**

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Total No. of Questions : 5]

SEAT No. :

P4174

[Total No. of Pages : 2

[5255]-672

M.E. (Instrumentation & Control) (Process Instrumentation)
ADVANCED CONTROL SYSTEM
(2013 Course) (Semester-II) (506109)

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 candidates indicate full marks.***
4) ***Use of electronic pocket calculator.***
5) ***Assume suitable data, if necessary.***

Q1) Attempt any two of the following:

a) Differentiate linear and nonlinear systems in detail. **[5]**

b) Explain jump response characteristics of nonlinear system with example. **[5]**

c) Explain concept of phase plane in control system analysis. **[5]**

Q2) Attempt any two of the following:

a) Define describing function? Find describing function for saturation element. **[5]**

b) Explain concept of describing function analysis for non-linear system with necessary diagrams. **[5]**

c) Discuss explain limit cycle and its types with necessary diagrams. **[5]**

Q3) Attempt any two of the following:

a) Explain stability in the sense of Lyapunov with graphical representation. **[5]**

b) Show that following quadratic form is positive definite. **[5]**

$$V(x) = 8x_1^2 + x_2^2 + 4x_3^2 + 2x_1x_2 - 4x_1x_3 - 2x_2x_3$$

c) Determine the stability of a non-linear system governed by equation **[5]**

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

$$\dot{x}_2 = -x_2 - x_1$$

P.T.O.

Q4) Attempt any two of the following:

a) Explain zero dynamics in feedback linearization with example. **[5]**

b) Explain input-output linearization in detail with example. **[5]**

c) Explain input-state linearization in detail with example. **[5]**

Q5) Attempt any two of the following:

a) Design a sliding mode control for any system. Also draw its outputs. **[5]**

b) With reference to sliding mode control theory explain control, surface and reachability in detail with necessary diagrams. **[5]**

c) What is chattering in SMC? Also explain techniques used for avoidance of chattering. **[5]**

Total No. of Questions :5]

SEAT No. :

P4175

[Total No. of Pages :2

[5255] - 673

M.E. Instrumentation & Control (Process Instru.)

ADVANCED SIGNAL PROCESSING

(2013 Course) (Semester III) (606101)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Attempt any two questions from Q.1,Q.2,Q3,Q.4, and any one question from Q.5***
3) ***Neat diagram must be drawn whenever necessary.***
4) ***Figure to the right candidates indicate full marks..***
5) ***Use of electronic pocket calculator.***
6) ***Assume suitable data, if necessary.***

Q1) a) Compute Eight point DFT of given sequence $x[n]=\{1\ 1\ 1\ 1\ 1\ 1\ 0\ 0\}$ **[5]**

b) Explain different features of STFT. **[5]**

c) Compare structures of Decimation In Time and Decimation In Frequency FFT algorithm. **[5]**

Q2) a) Explain Recursive Least Square Adaptive filters. **[5]**

b) Give the different representation of systems Convolution in homomorphic system. **[5]**

c) With basic model of speech production, explain speech parameter estimation using homomorphic deconvolution. **[5]**

Q3) a) Explain the term Decimation and Interpolation. **[5]**

b) Explain Multiresolution Analysis in wavelet. **[5]**

c) Explain how two digital systems are interfaced using different sampling rate **[5]**

P.T.O.

Q4) a) Polyphase matrix for a three -channel PR reconstruction FIR QMF bank is $p(z^3) = \begin{bmatrix} 1 & 2 & 2 \\ 2 & -2 & 1 \\ 1 & 0 & -1 \end{bmatrix}$ Determine the analysis and synthesis filters in QMF bank. **[5]**

b) Explain simple alias free QMF system. **[5]**

c) Why brick wall filter characteristics are not suitable in frequency subdivision of speech signal? Explain frequency subdivision of speech signal using QMF filters. **[5]**

Q5) a) Write Short note on Schur Algorithm for solution of Normal Equations. **[10]**

b) Enlist different Parametric methods for power spectrum estimation, explain any two in details. **[10]**

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Total No. of Questions : 7]

SEAT No. :

P4176

[Total No. of Pages : 2

[5255]-674

M.E. (Process Instrumentation & Control)
BUILDING AUTOMATION
(2013 Course) (Semester-III) (606102)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Explain Addressable fire alarm system with neat sketch. **[6]**

b) Write a short notes on "Fire Suppression System". **[4]**

Q2) a) Explain Standalone Access Control System with neat Sketch. **[6]**

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

Q3) a) Classify Air Conditioning system. Explain any one type of Air conditioning system with neat sketch. **[6]**

b) Write a short notes on Fan Coil Units. **[4]**

Q4) a) Explain any one type of compressor used in Vapour compression cycle with neat sketch. **[6]**

b) Write a short notes on Chilled water coil. **[4]**

Q5) a) List and Explain benefits of Direct digital control system. **[6]**

b) Write a short notes on Lon Works. **[4]**

P.T.O.

Q6) a) Explain BMS in detail with neat sketch. **[6]**

b) Write a short notes on Green building. **[4]**

Q7) a) Explain Project Management. What are the characteristics of project. **[6]**

b) Write a short notes on project life cycle. **[4]**

Total No. of Questions : 8]

SEAT No. :

P4177

[Total No. of Pages : 2

[5255] - 675

M.E. (Instrumentation & Control) (Biomedical Instrumentation)

BIO-SIGNAL PROCESSING

(2013 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) Determine the unit-step response of the system described by the difference equation : $y(n) = 0.9y(n-1) - 2.8y(n-2) + 2x(n)$. **[10]**

Q2) Determine the auto-correlation for $x(n) = \{12, 15, 17, 19, 20, 23\}$. **[10]**

Q3) Determine and sketch the frequency response of a system given by : **[10]**

$$3y(n)+\frac{5}{4}y(n-1)+\frac{3}{8}y(n-2)=5x(n)+6x(n-1).$$

Q4) a) Determine the circular convolution of the following sequences using DFT property : **[6]**

$x_1(n) = \{4, 3, 1, 16\}$

$x_2(n) = \{8, 8, 2, 12\}$

b) State the following properties of DTFT : **[4]**

i) Time reverse.

ii) Frequency shift.

Q5) Design an FIR high-pass filter with $\omega_c = 2\pi/3$ rad/sec and M = 13. Use rectangular and Hamming window functions. **[10]**

P.T.O.

Q6) Explain the RLS algorithm of adaptive filtering in detail. **[10]**

Q7) Compute the 8-point DFT of sequence $x(n) = \{7, 3, 1, 1, 3, 5, 6, 0\}$ using decimation-in-frequency radix-2 FFT algorithm. **[10]**

Q8) a) Determine the order and poles of a low-pass Butterworth filter that has a - 3 dB bandwidth of 400 Hz and an attenuation of 40 dB at 800 Hz. **[5]**

b) Determine the order and poles of a low-pass Chebyshev-I filter that has a 1 dB ripple in the passband, cut-off frequency $\Omega_p = 200\pi$, a stopband frequency of $\Omega_s = 300\pi$ and an attenuation of 38 dB or more for $\Omega \geq \Omega_s$. **[5]**

Total No. of Questions :7]

SEAT No. :

P4178

[Total No. of Pages :2

[5255] - 676

M.E. (Biomedical Instrumentation & Control)

ANALYTICAL INSTRUMENTATION

(2013 Pattern) (Semester - I) (506203)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figures to the right candidates 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) List Advantages and disadvantages of Instrumental method over chemical analysis method. **[5]**

b) Explain double beam filter photometer with neat sketch. **[5]**

Q2) a) State and derive beer's and lambert Law. **[5]**

b) Explain Direct Reading Spectrophotometer with neat sketch. **[5]**

Q3) a) Explain Atomic Absorption Spectroscopy with neat sketch. **[5]**

b) Write a short notes on Interferometer used in FTIR. **[5]**

Q4) a) Explain Gas Chromatography with neat sketch. **[5]**

b) Explain Dual Lead Reciprocating Pump used in HPLC with neat sketch. **[5]**

P.T.O.

Q5) a) Explain with neat sketch Ratio Recording flouriometer. **[5]**

b) Explain X - Ray Instrumentation With Neat sketch. **[5]**

Q6) a) Explain with neat sketch GM Counter. **[5]**

b) Explain NMR with neat sketch. **[5]**

Q7) a) What is ESCA? Explain in brief Auger emission spectroscopy. **[5]**

b) Explain the experimental setup of Conductometry with neat sketch. **[5]**

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Total No. of Questions : 5]

SEAT No. :

P4179

[Total No. of Pages :2

[5255] - 677

M.E. (Instrumentation & Control) (Biomedical)

TRANSDUCER DESIGN

(2013 Pattern) (Semester - II) (506207)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator.***
5) ***Assume suitable data, if necessary.***

Q1) Attempt any two of the following.

a) List different characteristics of sensors and its importance in selection of sensors. **[5]**

b) Give importance of proximity sensors. Explain any one in detail. **[5]**

c) List applications of transducers in Biomedical and explain any one in detail. **[5]**

Q2) Attempt any two of the following.

a) Explain important characteristics of semiconductor type strain gauges in detail. **[5]**

b) Explain construction and working of digital thermometer used for measurement of human body temperature. **[5]**

c) Explain design of electromechanical transducer for level measurement. **[5]**

P.T.O.

Q3) Attempt any two of the following.

a) Explain design of weight measurement system using strain gauge load cell. **[5]**

b) Explain different primary force sensors in detail. **[5]**

c) Explain industrial applications of gas sensors. **[5]**

Q4) Attempt any two of the following.

a) Give general selection criteria for any flowmeter. **[5]**

b) Explain biosensors and its applications. **[5]**

c) Explain manufacturing process of MEMS with neat sketch. **[5]**

Q5) Attempt any two of the following.

a) List different gas sensor with its application. **[5]**

b) What are chemical sensors? Explain their importance in measurement systems. **[5]**

c) Write short note on LASER applications. **[5]**

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Total No. of Questions :8]

SEAT No. :

P4180

[Total No. of Pages :2

[5255] - 678

M.E. Instrumentation and Control (Bio Medical)

DIGITAL IMAGE PROCESSING

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Solve any 5 questions.***
2) ***Assume suitable data, if necessary.***
3) ***Use of Calculators, log tables, charts is allowed.***
4) ***Figures to the right indicate full marks.***

Q1) a) Explain hardware used in digital image processing. **[5]**

b) Explain the characterisitcs of image digitizer. **[3]**

c) Draw the block diagram of fundamentals steps in digital image processing system. **[2]**

Q2) a) Explain brightness adaption and discrimination. **[4]**

b) Explain pixel connectivity. **[4]**

c) Define path and length of path. **[2]**

Q3) Obtain the 2D DFT and 2D DCT of the following image: **[10]**

1	2	3
4	5	6
7	8	9

P.T.O.

Q4) a) Enhance the following image using laplacian derivative filter. **[5]**

1	2	3
4	5	6
7	8	9

b) Explain image enhancement in frequency domain. **[5]**

Q5) a) Explain weiner filter. **[5]**

b) Explain digital image resoration system. **[3]**

c) List image restoration techniques. **[2]**

Q6) a) Explain discontinuities detection techniques with suitable examples. **[5]**

b) Explain fourier discriptors. **[3]**

c) Write soble and canny operators for edge detection. **[2]**

Q7) a) Enhance the following image using average low pass filter. **[5]**

1	2	3
4	5	6
7	8	9

b) Detect edges in the following image using sobel operator. **[5]**

1	0	1
0	1	0
1	0	1

Q8) a) Explain minimum, maximum and median filters for image enhancement. **[5]**

b) Enlist boundry descriptors and explain any one with suitable example. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4181

[Total No. of Pages : 2

[5255]-679

M.E. (Instrumentation and Control) (Biomedical Engineering)
COMMUNICATION PROTOCOLS FOR INSTRUMENTATION
(2013 Course) (Semester-II) (506209)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Solve any five questions.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the physical layer of HART. **[4]**

b) Compare MODBUS and MODBUS plus protocols. **[4]**

c) What is a data frame in communication? List any two fields used in a frame. **[2]**

Q2) a) Explain the steps involved in calibrating the HART field devices. **[4]**

b) Explain the role of Ethernet in Communication Protocols. **[4]**

c) Explain Asynchronous Communication with neat waveform. **[2]**

Q3) a) Explain the following test procedures done during commissioning of Fieldbus devices. **[4]**

i) Segment testing ii) Field Device testing

b) How does redundancy handle failure of physical medium in Fieldbus? **[4]**

c) Explain the token passing method used for bus arbitration. **[2]**

P.T.O.

Q4) a) With neat diagrams, explain the following topologies used in process industry. **[4]**

i) Daisy chain ii) Chicken foot

iii) Point to point iv) Spur

b) With a neat diagram, explain the mapping of variants of Profibus on the OSI layer. **[4]**

c) Explain the Logical Link Control and Adaptation Protocol (L2CAP) layer of the Bluetooth protocol stack. **[2]**

Q5) a) Explain the Resource block, Transducer block and function block in Fieldbus devices. **[5]**

b) List and explain any three Universal HART commands. **[3]**

c) Explain any two applications of Bluetooth protocol. **[2]**

Q6) a) Explain the redundancy and failure considerations in Fieldbus. **[5]**

b) List any six features of RS 232 communication. **[3]**

c) What is the role of Device Description files? **[2]**

Q7) a) With neat diagrams, explain the hybrid method used for regulating media access in Profibus DP systems. **[5]**

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

Q8) a) Discuss Advantages and Limitations of Open Networks. **[5]**

b) What are segment couplers? With a neat sketch explain the bus access via segment coupler in Profibus PA network. **[5]**

Total No. of Questions :8]

SEAT No. :

P4182

[Total No. of Pages : 2

[5255] - 680

M.E (Biomedical Instrumentation & Control)

MEDICAL IMAGING TECHNIQUES

(2013 Course) (Semester III) (606201)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any FIVE Questions.***
2) ***Use of scientific calculator is allowed.***
3) ***Draw diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Draw electromagnetic spectrum and explain its different ranges. **[5]**

b) Why we should use different imaging techniques? **[3]**

c) Explain Automatic Exposure Control using Phototimers. **[2]**

Q2) a) Compare characteristic and Bremstrahaulng Xrays. **[4]**

b) Define Contrast. Explain Gray scale of contrast. **[4]**

c) What is Selective filtration? How it is achieved? **[2]**

Q3) a) Explain the role of computer in Computed Tomography. **[5]**

b) Draw block diagram of Xray tube and explain it in detail. **[5]**

Q4) a) Describe the Schileren system used to visualize the ultrasound field. **[4]**

b) What are the front panel controls of X ray machine? Describe them in detail. **[4]**

c) What is Confusion Matrix? **[2]**

Q5) a) List the transmission modes of ultrasound. Explain Pulsed Doppler mode of transmission. **[4]**

b) How the Computed Tomography system is tested and calibrated ? **[4]**

c) What are the advantages of Digital Radiography? **[2]**

P.T.O.

Q6) a) Explain the role and working of Bucky Diaphragm in Xray imaging. **[3]**

b) What are the advantages and risk associated with MRI imaging? **[5]**

c) Enlist the advantages of thermography over other imaging techniques. **[2]**

Q7) a) Explain the principle of Positron Emission Tomography. With the help of a diagram describe various building blocks of PET scanner. **[5]**

b) Describe the M mode of ultrasound with the help of a neat diagram and explain any one application of it. **[5]**

*Q*8) a) Write a shortnote on 'SPECT'. **[5]**

b) Describe various detectors used in nuclear medicine. **[3]**

c) What is Doppler Effect in ultrasound? **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4183

[Total No. of Pages : 2

[5255]-681

M.E. (Instrumentation and Control) (Biomedical Instrumentation)
ADVANCED DIGITAL SIGNAL PROCESSING
(2013 Pattern) (Semester-III) (606202)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Explain Short Time Fourier Transform and state its properties. **[5]**

b) Discuss Time Frequency Distribution. **[5]**

Q2) a) Obtain the DOWN sampling of the causal signal x(n) = 3*n, by the factor of 6. **[5]**

b) Explain Interpolation with polyphase filters. **[5]**

Q3) a) Explain SSS and WSS processes. **[4]**

b) Explain spectral factorization. **[6]**

Q4) a) Explain power spectral estimation with suitable example. **[4]**

b) Explain Bartlett method of PSD estimation. **[6]**

Q5) a) Explain applications of adaptive filtering. **[5]**

b) Explain LMS algorithm for adaptive filter design. **[5]**

P.T.O.

Q6) a) Explain International broadcasting standards. **[5]**

b) Explain JPEG 2000 standard of image compression. **[5]**

Q7) a) Explain homomorphic signal processing for convolution. **[5]**

b) Explain the need of data compression with suitable example. **[5]**

Q8) a) Explain adaptive filter. **[5]**

b) Explain Periodogram method for power spectrum estimation. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4184

[Total No. of Pages : 2

[5255]-682

M.E. (Computer Engineering)

APPLIED ALGORITHMS

(2013 Pattern) (Semester - I) (510101)

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

Q1) a) State whether following equalities are true or false and prove it. **[5]**

i) $2n^2 + 3n + 1 = 2n^2 + \theta(n)$

ii) $2n^2 + \theta(n) = \theta(n^2)$

b) Explain characteristics of algorithm with suitable example. **[5]**

Q2) a) Explain asymptotic notations with example. **[5]**

b) Explain the Best, Average, and Worst case of any one sorting algorithm. **[5]**

Q3) a) Describe all pair shortest path algorithm in graph. **[5]**

b) Write about the Epsilon approximation algorithm. **[5]**

Q4) a) Explain Krushkal's algorithm for minimum spanning tree. **[5]**

b) Write about approximation version of Knapsack algorithm. **[5]**

Q5) a) Discuss Graham scan and Jarvis march algorithm. **[5]**

b) Write the Approximation Vertex cover algorithm. **[5]**

P.T.O.

Q6) a) Explain the standard and slack forms of linear programming. **[5]**

b) What are the basic properties of Line, Intersection of Line and Line Segment? **[5]**

Q7) a) Explain Bay's rule with example. **[5]**

b) Explain simplex method of LPP with example. **[5]**

Q8) a) What are uncorrelated variables and transform methods. **[5]**

b) Explain Exception, Moments and variance with example. **[5]**

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Total No. of Questions : 6]

SEAT No. :

P4185

[Total No. of Pages : 2

[5255] - 683

M.E. (Computer Engineering)

HIGH PERFORMANCE DATABASES

(2013 Credit Pattern) (510102) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***All six questions are compulsory.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Assume suitable data if necessary.***

Q1) a) Why is database tuning important? How do we tune indexes and the conceptual schema? **[4]**

b) Answer the following questions (any one) : **[3]**

i) Why do we have standardized database benchmarks, and what common Metrics are used to evaluate database system? Describe a few popular Database benchmarks.

ii) Why is automatic index tuning is a hard problem? Give an example.

Q2) a) Explain allocation of fragments in Distributed Database Management. **[4]**

b) Explain 2-Phase Commit protocol in Distributed Databases. **[5]**

Q3) a) Explain key properties of Long-Duration Transaction. **[4]**

b) Consider a main-memory databases system recovering from a system crash. Explain the relative merits of : **[5]**

i) Loading the entire database back into main memory before resuming transaction processing.

ii) Lading data as it is requested by transaction.

Q4) a) Consider bibliography Database System for different database entities such as book, book year, author, editor, title, publisher, price etc. Design XML DTD, XML Schemas with constraints for bibliography Database System. **[5]**

P.T.O.

b) Write a short note on (any one) : **[4]**

i) SOAP.

ii) XSLT.

Q5) a) Explain Semi-structured databases. What are the features of COUCHDB. **[4]**

b) Suppose you have special databases that support region queries but not nearest queries. Describe an algorithm to find the nearest neighbour by making use of multiple region queries. **[5]**

Q6) a) Explain Map Reduce Types and Formats with suitable examples. **[4]**

b) Solve any one : **[3]**

i) Explain the use of Task Tracker in Hadoop cluster.

ii) Write short note on Multimedia Database.

Total No. of Questions :6]

SEAT No. :

P4186

[Total No. of Pages :2

[5255] - 684

M.E. (Computer Engineering)

ADVANCED COMPUTER ARCHITECTURE

(2013 Pattern) (Semester - I) (510103)

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.***

Q1) What is the shared memory concept? Describe the UMA & NUMA shared memory multi-processor model. **[9]**

OR

Define & explain the following terms W.r.t. various interconnect architectures (Any three) : **[9]**

a) Network diameter.

b) Crossbar Network.

c) Node degree.

Q2) Explain the various standard measures adopted by industry for computer performance measurement. **[8]**

OR

Comment on benefit of pipelining. Explain the instruction & arithmetic pipelining. **[8]**

Q3) Design arithmetic pipeline for floating point adder using **[8]**

$X = A * 2^a$

$Y = B * 2^b$

OR

Explain the concept pf pipelining in super scalar processor. How the RISC designed in POWER architecture. **[8]**

P.T.O.

Q4) What is cache coherency problem. Explain the software solution on cache coherency problem. **[8]**

OR

Discuss multi-threaded computation model. Explain the latency problems in remote loads. **[8]**

Q5) State the basic mechanism for interposes communication.

Discuss shared variable model in parallel programming. **[8]**

OR

Comment on the role of compiler to reduce the burden on programmer. Explain the compilation phases in parallel code generation. **[8]**

Q6) Explain the following terms w.r.t. cloud computing: **[9]**

a) Infrastructure As Service

b) Platform As Service

c) Software As Service.

OR

Explain in brief the following architectures w.r.t. distributed parallel processing: **[9]**

a) Quantum computing.

b) Neuro computing.

c) Grid computing.

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Total No. of Questions :6]

SEAT No. :

P4187

[Total No. of Pages : 2

[5255]-685

M.E. (Computer Engineering)

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I) (510104)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Choose any problem in computer engineering and state what type of research it is ? What is the objective and motivation of it? Draw work flow of the defined problem. **[8]**

OR

b) Briefly describe the different steps involved in a research process. **[8]**

Q2) a) Why literature survey is required in research? State and explain the different sources of information. Identify any five journal list in your domain. **[9]**

OR

b) What is research problem? Define the main issues which should receive the attention of the researcher in formulating the research problem. Give suitable examples to explain your points. **[9]**

Q3) a) Explain the meaning of the following in context of Research design. **[8]**

i) Extraneous variables.

ii) Confounded relationship.

iii) Research hypothesis.

iv) Experimental and Control groups.

OR

b) Explain the meaning and significance of a Research design. **[8]**

P.T.O.

Q4) a) Explain the meaning of analysis of variance (ANOVA). Describe briefly the technique of analysis of variance for one way and two way classification. **[8]**

OR

b) Explain

i) Parametric statistics

ii) Non-parametric statistics **[8]**

Q5) a) The procedure of testing hypothesis requires researchers to adopt several steps. Describe in brief all such steps. **[8]**

OR

b) Define

i) central tendency,

ii) dispersion,

iii) skewness ,

iv) kurtosis. **[8]**

Q6) a) State in brief layout of research report and what precautions one should take for writing research report. **[9]**

OR

b) Why optimization is required in research? List and explain any one Optimization method. **[9]**

Total No. of Questions : 12]

SEAT No. :

P4188

[Total No. of Pages :3

[5255] - 686

M.E. (Computer Engineering)

OPERATING SYSTEM DESIGN

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***All Six Questions are compulsory.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) a) Demonstrate the two level implementation of operating system. **[5]**

b) What hardware instructions are removed from the virtual processor? Why they are removed? How they are removed? What are they replaced with? **[4]**

OR

Q2) a) Why do we call operating system an event handler and table manager? **[5]**

b) Explain how rendezvous pattern consists of two signaling pattern. **[4]**

Q3) a) What is mutual Exclusion? Why mutual Exclusion is most important IPC pattern for completion for resources? **[4]**

b) Explain steps in making system call with diagram. **[4]**

OR

Q4) a) The interval timer only counts down to zero. Suppose we wanted to keep the time of the day. How could we use the interval timer to keep the time of day? **[4]**

P.T.O.

b) Of the following scheduling methods, which only sense as preemptive scheduling policies, Which only make as nonpreemptive scheduling policies and which could be either **[4]**

i) First come first serve

ii) Round Robin

iii) Priority

iv) Multiple queues

v) Shortest job first

Q5) a) Explain how the database access and update IPC pattern is really a complicated variation of the mutual exclusion IPC pattern. **[4]**

b) Why is first-come, first-serve scheduling is fair? What is the main advantage of shortest job first scheduling over first-come, first-serve scheduling?**[4]**

OR

Q6) a) What is response ratio? What is the advantage of highest response ratio next scheduling over shortest job first scheduling. **[4]**

b) Why is mutual exclusion the most important IPC pattern for competition for resource? Why busy waiting cannot be used for solving general mutual exclusion problem? **[4]**

Q7) a) Why are there two levels of memory management? What are the major steps through when a program must before it can be loaded into memory Exclusion? **[4]**

b) Compare the *brk* and allocate memory system calls described in memory management? **[4]**

OR

Q8) a) Give the advantage of and disadvantage of keeping allocated blocks on the lock list? **[4]**

b) Compare segment and pages. How can the logic address space be contiguous if the physical address space is not configure? **[4]**

Q9) a) What is the purpose of device driver? Describe any two differences between block devices and character devices. **[4]**

b) What is Shortest Seek Time First (SSTF)? How elevator algorithm is useful in SSTF? State and Explain the elevator algorithm with batch processing in detail. **[4]**

OR

Q10)a) Some file system keeps versions of files. In such a file system one can go back access old versions of a file. Compare this with a text editor that keeps history of all edits and allow you to undo edits. Describe pros and cons of unifying these two mechanism. **[4]**

b) What is DMA controller? Why it is used? Give any two advantages of a DMA device controller over a Non-DMA device controller. **[4]**

Q11)a) Suppose we wanted to integrate the memory scheduler and processor scheduler. What information would they exchange, How would they use that information? **[5]**

b) What is authentication? What do you mean when we say an operation is "authorized"? How are passwords used for authentication? **[4]**

OR

Q12)a) What is meant by consumable resource? Is preemption of resource is possible? If yes state with example? **[5]**

b) State and explain the model of resource management. What are the tasks for which resource manager is responsible? **[4]**

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Total No. of Questions :6]

SEAT No. :

P4189

[Total No. of Pages :2

[5255] - 687

M.E. (Computer Engineering)

SOFTWARE DESIGN AND ARCHITECTURE

(2013 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 diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) How is Software Architecting different from Software Designing. **[8]**

b) When and why is it important to describe multiple architectural views? **[8]**

OR

Q2) a) State and explain any Five benefits that a business and an IT organization can derive from a sound software architecture. **[8]**

b) Describe the role of the architectural concept in knowledge transfer. What are the different types and challenges of knowledge. **[8]**

Q3) a) What are Component-and-Connector styles? Give examples of variation in implementation of the Component-and-Connector Styles. **[8]**

b) Explain Views, Viewtypes and Styles. For a particular system how are the relevant views identified? Explain with an example. **[8]**

OR

Q4) a) Explain the two styles of interaction oriented software architecture, (MVC) Model - View-Controller and (PAC) Presentation-Abstraction-Control. **[8]**

b) Explain (SOA) Service Oriented Architecture with its advantages. Give its applications in Web Services. **[8]**

P.T.O.

Q5) a) Explain layered architecture in Hierarchal architectures and comment on its application domain. **[9]**

b) Define Customer Relationship Management (CRM). Discuss about CRM approaches and tools. **[9]**

OR

Q6) a) Describe Quantity archetype pattern and Rule archetype pattern with example. **[9]**

b) Explain (MDA) Model Driven Architecture. What all steps are requried to configure and automate it. **[9]**

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Total No. of Questions : 6]

SEAT No. :

P4190

[Total No. of Pages : 2

[5255]-688

M.E. (Computer Engineering)
ADVANCED COMPUTER NETWORKS
(2013 Course) (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 general principals of network design and write the process of network design. **[9]**

OR

b) Explain the issue of resource allocation and mobility with suitable examples. **[9]**

Q2) a) What is Multiplexing of Traffic on a Communication Link? Explain any two Applications of Little's Theorem. **[8]**

OR

b) The mean time between arrivals of customers in a bank is 3 minutes. Write the expression for the exponential distribution for average time between arrivals for any time t (t > = 0). If a customer has already arrived in the bank, what is the probability that the next customer will come after 10 minutes? What is the probability that 5 customers will arrive in the one hour interval? **[8]**

Q3) a) Explain open, semi open and closed queue network with suitable example. **[8]**

OR

b) What is CMST? Explain how Sharma's algorithm optimizes CMST? **[8]**

P.T.O.

Q4) a) What is resource reservation in traffic engineering? Explain with suitable examples. **[8]**

OR

b) Enlist and explain different Quality of Services mechanisms considered while designing networks. **[8]**

Q5) a) What is a routing using mask? Compare Unreliable, Connectionless and Best effort IP service. **[8]**

OR

b) Explain aggregation feature in IPV6 with suitable examples. **[8]**

Q6) Write Short notes on (any Three): **[9]**

a) Wireless and sensor networks

b) Domain specific network

c) Computer Network Simulation

d) Next generation networks

Total No. of Questions : 6]

SEAT No. :

P4191

[Total No. of Pages : 2

[5255] - 689

M.E. (Computer Engineering)

ADVANCED STORAGE SYSTEMS AND INFRASTRUCTURE MANAGEMENT

(Semester - III) (2013 Pattern) (610101)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt any FIVE questions.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) An application has a 1,000 heavy users at a peak of 2 IOPS each and 2, 000 typical users at a peak of 1 IOPS each. It is estimated that the application also expriences an overhead of 20 percent for other workloads. The read/write ratio for the application is 2 : 1. Calculate RAID corrected IOPS for RAID 1/0, RAID 5, and RAID 6. **[5]**

b) Explain meaning of term "Digital data". **[5]**

Explain the factors contributing to the growth of digital data. Also explain types of data.

Q2) a) With the help of a neat diagram, illustrate FCSAN evolution from FC-AL to enterprise SANs. Also explain, components of FC SAN. **[5]**

b) Explain storage virtualization. Enlist and explain the types of storage virtualization. **[5]**

Q3) a) A system has three components and requires all three to be operational 24 hours, Monday through Friday. Failure of component 1 occurs as follows:

- Monday = No failure

P.T.O.

- Tuesday = 5 a.m. to 7 a.m.
- Wednesday = No failure
- Thursday = 4 p.m. to 8 p.m.
- Friday = 8 a.m. to 11 a.m.

Calculate the MTBF and MTTR of component 1. Also calculate the availability of the component 1. **[5]**

b) Explain following storage array-based local replication implementations

i) Full -Volume mirroring.

ii) Pointer - based, Full - volume replication.

iii) Pointer based virtual replication. **[5]**

Q4) a) Explain the current business demands. Also explain complexity of today's computing environment. **[5]**

b) Explain how evolution of systems from mainframes upto new age systems, have affected the system management. **[5]**

Q5) a) With the help of a neat diagram, explain activities of service level management. **[5]**

b) With the help of a flow-chart, explain activities carried out in Reactive Problem Managment. **[5]**

Q6) Explain following in the context of Infrastructure Management.

a) Factors to consider in designing IT organisations. **[5]**

b) Information Technology Infrastructure Library. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4192

[Total No. of Pages : 2

[5255]-690

M.E. (Computer Engineering)
ADVANCED UNIX PROGRAMMING
(2013 Pattern) (Credit) (Semester-III) (610102) (Elective-III)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions out of eight questions given.***
2) ***Draw neatly labeled diagram wherever necessary.***
3) ***Figures to right indicate full marks.***
4) ***Irrelevant answers will not attract any marks.***
5) ***Assume suitable data, if required.***

Q1) a) Explain how power of prediction in register stack engine help in enhancing performance IA-64 processor. **[7]**

b) With neatly labeled diagram explain IA-64 Architecture. **[3]**

Q2) a) Explain how "SIGCHILD" used in signal handling help avoiding zombie formation in UNIX system. **[7]**

b) What is signal disposition? What is the facility available to ignore unwanted signals? **[3]**

Q3) a) It possible to handle multiple inputs and output operations simultaneously in UNIX? Justify your answer in any case. **[7]**

b) What problems one may encounter if he or she used wait ( ) instead of waitpid ( ) in a program when one parent spawns multiple children which may return at different times. **[3]**

Q4) a) Write and explain program to demonstrate use of single full duplex pipe for two way communication. **[7]**

b) Explain popen ( ) and pclose ( ) calls used in PIPES. **[3]**

P.T.O.

Q5) a) Write a code and explain multithreaded server. **[7]**

b) Explain readv ( ) and writev ( ) calls. **[3]**

Q6) a) Give detail explanation of all steps involved in implementation of RPC. **[7]**

b) Why multiple threads cannot use the buffer to hold different things simultaneously. When faced with this problem, what are the various solutions available? **[3]**

Q7) a) Explain all the steps involved in implementation of concurrent server using UDP socket. **[7]**

b) State significance of SO_REUSEADDR call in socket communication. **[3]**

Q8) Write a short note on (Any Two): **[5+5]**

a) Fork ( ) with exec ( )

b) Select ( ) V/s pselect ( )

c) Close ( ) V/s shutdown ( )

d) RPC V/s RMI

Total No. of Questions : 9]

SEAT No. :

P4193

[Total No. of Pages : 2

[5255]-691

M.E. (Computer Engineering) (C.N.)

ADVANCED NETWORK ALGORITHMS

(2013 Credit Pattern) (Semester - I) (510201)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.***
2) ***Attempt any two questions from Q.7 or Q.8 or Q.9.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain characteristics of network algorithmics. **[5]**

b) Explain with neat diagram abstract model for protocol. **[5]**

OR

Q2) a) Explain different types of memories. **[5]**

b) Explain end node architecture. **[5]**

Q3) a) Explain with neat diagram protocol processing. **[5]**

b) Explain binary search on prefix lengths with neat diagram. **[5]**

OR

Q4) a) Explain buffer management with neat diagram. **[5]**

b) Explain cyclic redundancy checks and checksum. **[5]**

Q5) a) Explain validation of application device channels. **[5]**

b) Explain with neat diagram ethernet monitor using bridge hardware. **[5]**

OR

P.T.O.

Q6) a) Explain trie node compression with neat diagram. **[5]**

b) Explain packet filtering in routers. **[5]**

Q7) a) Sketch the scenario of shared multicast accept pointer in ESLIP. **[5]**

b) Explain a note on lookup chip model. **[5]**

Q8) a) Write a pseudo code for load balancing algorithms at routers. **[5]**

b) Explain in detail the technique of detecting worms. **[5]**

Q9) a) With a reference to packet classification, explain linear search algorithm with example. **[5]**

b) With reference to router, explain in details chi-square algorithm. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4194

[Total No. of Pages : 2

[5255] - 692

M.E. (Computer) (Computer Networks)

WIRELESS COMMUNICATION

(2013 Course) (Semester - I) (510202)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Assume suitable data if necessary.***

Q1) a) Write a short note on salient features of WiMAX. **[6]**

b) Explain Advanced Antenna Systems for Performance Enhancements in WiMax network, also discuss about enhanced frequency reuse mechanism. **[6]**

OR

Q2) a) Define QoS, discuss about Admission Control mechanism, also explain MPLS network and components development for delivering end-to-end QoS in an IP network with figure. **[6]**

b) Explain Resource-Allocation Techniques for OFDMA. **[6]**

Q3) a) Explain different components of Mobile IP. **[6]**

b) Why Broadband wireless link is required to transmit multimedia data? Describe simple call setup using SIP. **[6]**

OR

Q4) a) Explain Closed-Loop MIMO framework for IEEE 802.16e-2005. **[6]**

b) What are the various stages of channel coding? Describe their functionalities. **[6]**

P.T.O.

Q5) a) What are the tasks performed by WiMax Radio Resource Management? **[6]**

b) Explain protocol stack of WiMAX. **[7]**

OR

Q6) a) What are the basic requirements to design a WiMax Mobility Management architecture? **[7]**

b) Explain Quality-of-Service Architecture of WiMAX. **[6]**

Q7) a) Explain 4G features and challenges. **[6]**

b) What are the benefits of Multiple Antenna Techniques in WiMax. **[7]**

OR

Q8) Write short notes on (Any Two) : **[13]**

a) Modelling of Computation for frequency domain MIMO channel.

b) Multichannel Multipoint Distribution system.

c) WiMAX paging network reference model.

Total No. of Questions :8]

SEAT No. :

P4195

[Total No. of Pages :2

[5255] - 693

M.E. (Computer Networks)

BOS COMPUTER ENGINEERING

Advanced Databases

(2013 Pattern) (Semester - I) (510203) (Theory)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) What do you mean by Database tuning. Why database tuning is required. **[6]**

b) Explain design of database fragmentation. **[6]**

OR

Q2) a) What is Database workloads. How to tune the conceptual schema. **[6]**

b) What is Distributed Databases. Discuss the Distributed database architecture in brief. **[6]**

Q3) a) How the transaction management is done in multi - databases. **[6]**

b) Explain how XML data can be retrieved using XPATH and XQUERY. **[6]**

OR

Q4) a) What do you mean by Long duration transactions. Explain how it is handled. **[6]**

b) What is semi-structured data. Whether XML is a semi - structured data or not. **[6]**

P.T.O.

Q5) a) Explain how the following terms are addressed in real time databases. **[10]**

i) Transaction Processing.

ii) Concurrency control.

b) Explain how the indexing of spatial data is done. **[3]**

OR

Q6) a) Write a short note on : **[10]**

i) Personal Databases.

ii) Temporal Databases.

b) Discuss the database issues in mobile computing environment. **[3]**

Q7) a) Describe how HADOOP helps in effectively managing the Large scale data. **[6]**

b) What is CouchDB. Discuss the data model and architecture of it. **[7]**

OR

Q8) a) Write a short note on : **[10]**

i) Standardization.

ii) Performance benchmarking.

b) Define E - commerce and enlist atleast two applications of E - commerce. **[3]**

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Total No. of Questions : 6]

SEAT No. :

P4196

[Total No. of Pages :2

[5255] - 694

M.E. (Computer Engineering) (Computer Networks)

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I) (510204) (Paper - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, charts, electronic pocket, calculator and steam table is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Describe the different steps involved in research process. **[9]**

OR

b) Distinguish between Research methods and Research methodology. **[9]**

Q2) a) What is research problem? Define the main issues which should receive the attention of the researcher in formulating the research problem. Give suitable examples to elucidate your points. **[8]**

OR

b) Explain Different types of research hypothesis with Suitable example. **[8]**

Q3) a) Describe some of the important research designs used in experimental hypothesis-testing research study. **[8]**

OR

b) How would you differentiate between simple random sampling and complex random sampling designs? **[8]**

P.T.O.

Q4) a) Calculate coefficient of correlation, coefficient of determination, and portable error from the following data. **[8]**

X	43	44	46	40	44	42	45	42	38	40	42	57
Y	29	31	19	18	19	27	27	29	41	30	26	10

OR

b) Enumerate the different methods of collecting data. Which one is the most suitable for conducting enquiry regarding family welfare programme in India? Explain its merits and demerits. **[8]**

Q5) a) What is 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

b) Describe some of the important applications and uses of computers in present times. **[8]**

Q6) a) Write a short note on 'Documentation' in the context of a research report. **[9]**

OR

b) Mention the different types of report, particularly pointing out the difference between a technical report and a popular report. **[9]**

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Total No. of Questions : 8]

SEAT No. :

P4197

[Total No. of Pages :2

[5255] - 695

M.E. (Computer Networks)

NETWORK DESIGN, MODELLING AND ANALYSIS

(2013 Pattern) (Semester - II) (510207)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt any FIVE questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) What is probability mass function for a random variable? What is its significance in the network designs? **[5]**

b) Explain probability distribution function with the help of mathematical modelling. **[5]**

Q2) a) Explain the relevance of priority queuing for network-intensive applications? **[5]**

b) Explain M/M/n queue state diagram. Explain its applications of it. **[5]**

Q3) a) Write a short note on (any Two) **[5]**

i) Little's Theorem.

ii) M/G/1 queue with vacation.

iii) Modeling Network as a Graph.

b) What are Greedy algorithms and Exchange algorithms? Explain. **[5]**

P.T.O.

Q4) a) Explain one speed one center design principle with an example? **[4]**

b) What are Access Networks? Explain any one architecture in detail? **[3]**

c) Explain Esau-Williams algorithm with its modelling. **[3]**

Q5) a) Explain network design principles? **[4]**

b) Explain MENTOR algorithm for router design? **[3]**

c) Explain Performance metrics for network design? **[3]**

Q6) a) What is Queuing network? Explain Open, Closed and Hybrid queuing networks? **[5]**

b) Explain with suitable example fault tolerance in centralised networks? **[5]**

Q7) a) What is access network design? Discuss issues in simple access network design? **[4]**

b) What are reliability constraints of network design? Explain. **[3]**

c) Explain COM algorithm of concentrator location? **[3]**

Q8) Write a short note on following (Any Three) **[10]**

a) Reliability Constraints.

b) Exponential distribution and its properties.

c) Router Architecture.

d) Centralized Vs. Distributed networks.

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Total No. of Questions : 8]

SEAT No. :

P4198

[Total No. of Pages : 2

[5255] - 696

M.E. (Computer Network)

DISTRIBUTED SYSTEMS

(Semester - II) (2013 Credit Pattern) (510208)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any three questions from Q.1, Q.2, Q.3, Q.4.***
2) ***Answer 3 questions from Q.5, Q.6, Q.7, Q.8 questions.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain the key challenges in design and development of applications in distributed system. **[5]**

b) What is remote method invocation? Explain remote method invocation. **[4]**

Q2) a) Discuss on Domain name system with example. **[4]**

b) State marshalling and unmarshalling. **[4]**

Q3) a) Compare connection less and connection oriented communication protocol with example. **[4]**

b) List out possible distinct difference between CORBA and XML. **[4]**

Q4) a) Discuss difference between TCP/IP and UDP protocol for socket based communication. **[3]**

b) What is lamport logical clock? Explain Lamport logical clock. **[5]**

Q5) a) Explain M-tier architecture and characterization of distributed system. **[4]**

b) Explain Resource sharing and web caching. **[4]**

P.T.O.

Q6) a) Explain distributed transactions and concurrency control. **[4]**

b) Explain Ricart - Agrawala Algorithm. **[4]**

Q7) a) Explain Raymond's tree - based algorithm. **[4]**

b) Explain Fair mutual exclusion algorithm. **[4]**

Q8) Write short notes on **[9]**

a) WSDL

b) UDDI

c) SOAP

Total No. of Questions : 12]

SEAT No. :

P4199

[Total No. of Pages : 2

[5255]-697

M.E. (Computer Networks)

HIGH PERFORMANCE NETWORKS

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Write a short note on **[4]**

i) MPLS

ii) Token Bus

b) Explain protocol stacks of TCP/IP in detail. **[4]**

OR

Q2) a) Explain WiMax in detail. **[4]**

b) Explain in detail Design Consideration of High Performance networking. **[4]**

Q3) a) Distinguish between ATM and X.25. **[4]**

b) List and explain the applications of Gigabit Ethernet. **[4]**

OR

Q4) a) Explain the Foundation of Gigabit Ethernet in detail. **[4]**

b) Write a short note on Full-duplex Ethernet. **[4]**

Q5) a) Explain in detail Core Aspects of ATM and its basic principles. **[5]**

b) Write a short note on ATM Traffic Management. **[4]**

OR

P.T.O.

Q6) a) Explain in detail AAL ATM service and traffic parameterization. **[4]**

b) Draw and explain ATM Protocol reference model. **[5]**

Q7) a) Explain in details MPLS and its considerations in the choice of cell Vs frames. **[5]**

b) Describe IP over ATM in details. **[4]**

OR

Q8) a) Explain MPLS signaling and routing protocol. **[5]**

b) Describe the all possible research areas in MPLS? **[4]**

Q9) a) Write a short note on Broadband wireless network evolution. **[4]**

b) Write a note on IEEE 802.16. **[4]**

OR

Q10)a) Explain physical and MAC layer of Wimax. **[4]**

b) Distinguish between Fixed broadband wireless network and Mobile broadband wireless network. **[4]**

Q11)a) Write a short note on GSM. **[4]**

b) Distinguish between GPRS and WCDMA. **[4]**

OR

Q12)Write a short note on:

a) LTE **[4]**

b) HSPA Family **[4]**

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Total No. of Questions :7]

SEAT No. :

P4200

[Total No. of Pages : 1

[5255] - 698

M.E. (Computer Networks)

ADVANCED TCP/IP

(2013 Pattern) (Semester III)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any 5 Questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***All questions carry equal marks.***
5) ***Assume suitable data, if necessary.***

Q1) a) Draw and explain TCP state transition diagram? **[5]**

b) What do you mean by socket? explain socket programming primitives? **[5]**

Q2) a) Explain fully qualified domain name and partially qualified domain name **[5]**

b) Explain Rlogin option negotiation? **[5]**

Q3) a) With help of example explain SMTP? **[5]**

b) Explain Internet mail access protocol? **[5]**

Q4) a) Explain transport layer security issues? **[5]**

b) What do you mean by firewall? explain types of firewall? **[5]**

Q5) a) Write note on TCP Tahoe and TCP Reno? **[5]**

b) What do you mean by congestion control? **[5]**

Q6) a) Explain ADOV protocol with one example? **[5]**

b) Write note on TCP West Wood and TCP Jersey? **[5]**

Q7) a) Draw and explain client server architecture? **[5]**

b) Write port no. of FTP, TELNET, SMTP < DNS, HTTP protocol? **[5]**

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Total No. of Questions : 12]

SEAT No. :

P4201

[Total No. of Pages : 2

[5255]-699

M.E. (Computer Networking)
SYSTEM OPERATIONS AND MAINTENANCE
(2013 Course) (Semester-III)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6, Q. No. 7 or 8, Q. No. 9 or 10, Q. No. 11 or 12.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is microkernel? Explain microkernel based operating system. **[5]**

b) Compare synchronous versus asynchronous inter process communication. **[4]**

OR

Q2) a) Write short note on "Cisco IOS XR Software. **[5]**

b) Explain components of IOS XR Layered High Availability Architecture. **[4]**

Q3) a) What is "TURBOBOOT"? Give the steps needed to boot the IOS XR software on a router. **[4]**

b) List and explain functionalities of Cisco IOS XR Configuration Manager. **[4]**

OR

Q4) a) Explain details of configuration commit and configuration rollback. **[4]**

b) What is two stage configuration model? Explain with suitable example. **[4]**

P.T.O.

Q5) What is SNMP? Which different versions of SNMP those are supported by Cisco IOS XR software? Also explain basic steps are needed to configure SNMP on an IOS XR router. **[8]**

OR

Q6) What is role of Access Control Lists in forwarding plane? Give key features of Access Control Lists. **[8]**

Q7) Explain in details Enhanced Interior Gateway Routing Protocol. **[8]**

OR

Q8) Explain OSPF protocol with example. **[8]**

Q9) What are basic requirements of multicast forwarding? Differentiate between IGMPv2 and IGMPv3. **[8]**

OR

Q10)Draw and explain Cisco IOS XR MPLS Architecture. **[8]**

Q11)Explain Functionalities of Three-Stage Fabric Links. **[9]**

OR

Q12)Explain Multimodule Configuration in IOS XR 3.5. **[9]**

Total No. of Questions : 5]

SEAT No. :

P4202

[Total No. of Pages : 3

[5255]-700
M.E. (I.T.)
MATHEMATICAL FOUNDATION OF INFORMATION TECHNOLOGY
(2013 Course) (Semester - I) (514401)

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) Solve any two.

a) Calculate median and mode of the data given below. Using them find arithmetic mean. **[5]**

Marks	10	20	30	40	50	60
No. of students	6	45	43	55	72	92

b) The probability of error in the transmission of a bit over a communication channel is $P = 10^{-4}$. What is the probability of more than three errors in transmitting a block of 1000 bits? **[5]**

c) Prove that the entropy for a discrete source is a maximum when the output symbols are equally probable. **[5]**

Q2) Solve any two.

a) Consider two membership functions as follows **[5]**

For fuzzy set A: $\mu_A(x) = \frac{|(60 - x)|}{8} + 1$

For fuzzy set B: $\mu_B(x) = \frac{|(40 - x)|}{8} + 1$

P.T.O.

Find the followings

1) $A \cup B$ 2) $A \cap B$ 3) $\bar{A}$ 4) $\bar{B}$ 5) $\bar{A} \cup \bar{B}$

b) Show that C = {000000,000111,111111} is a linear code. What is it's minimum distance. **[5]**

c) 100 digits were chosen at random from a set of tables. The frequencies of the digits were **[5]**

Digit	0	1	2	3	4	5	6	7	8	9
Frequency	12	19	23	21	14	25	22	20	21	15

Calculate Chi-square.

Q3) Solve any two.

a) Derive the formula for chi-square test and state its applications. **[5]**

b) Derive the mathematical model for entropy coding and coding efficiency. **[5]**

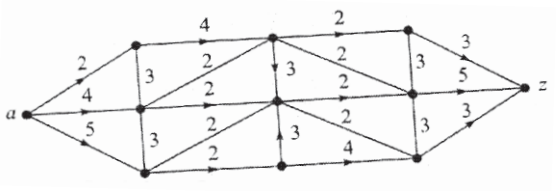
c) A train runs 20 miles at a speed of 30 m.p.h. another 50 miles at a speed of 40 m.p.h. then due to repair of the track travels for 6 minutes at a speed of 10 m.p.h and finally covers the remaining distance of 24 miles at a speed of 24 m.p.h What is the average speed in miles per hour. **[5]**

Q4) Solve any two.

a) A DMS has three output symbols with the probabilities {0.5,0.4,0.1}

Determine the Huffman code for this source and find the efficiency η. **[5]**

b) Find the maximum flow possible in the given transport network from a to z. **[5]**



c) Explain Hamming and Lee Metrics with example. **[5]**

Q5) Solve any two.

a) Write short notes on the following **[5]**

i) Additive property of Chi-square

ii) Chi-square as a test of 'goodness of fit'

b) A box contains 14 white and 6 black balls. Find the number of ways 4 balls can be drawn from the box if **[5]**

i) Three balls must be white

ii) All of them must have same color

c) Consider the elements defined in the universes X and Y as follows: X={2,4,6,8} and Y={p,q,r,s} . Find the Cartesian product of these sets, also find subset and draw coordinate diagram for the subset. **[5]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

P4203

[Total No. of Pages : 2

[5255]-701

M.E. (Information Technology)

APPLIED ALGORITHMS

(2013 Pattern) (Semester - I)

Time :3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Prove by contradiction that there exist infinite prime numbers. **[5]**

b) Prove by mathematical induction that the sum of the cubes of the first n positive integers is equal to the square of the sum of these integers. **[5]**

Q2) a) Give the recursive algorithm for finding the factorial of a number. Write down the recurrence, solve it and comment on its complexity. **[5]**

b) Describe the steps for finding out the complexity of non-recursive algorithm. Write the algorithm for insert sort and find its complexity. **[5]**

Q3) a) Define following terms with an example in each. **[5]**

i) Polynomial approximation scheme

ii) Approximation ratio

b) Explain with example the term persistent data structure. Explain with figure and write down the algorithm to insert an element into a singly linked list in persistent manner. **[5]**

P.T.O.

Q4) a) Define following terms and give example form each class. **[5]**

P, NP, NP hard and NP Complete Problems Show their relationship using diagram.

b) Explain with figures following operations on Splay tress **[5]**

i) Delete

ii) Join

Q5) a) Give randomized algorithm for pattern matching minimum spanning tree. **[5]**

b) Explain Travelling salesman problem. Give approximation algorithm for the same. Comment on its complexity. **[5]**

Q6) a) Give online algorithm for k-server problem. **[5]**

b) Explain with suitable examples, On-line and Off-line algorithms. **[5]**

Q7) a) Give an algorithm for insertion into B-Tree. Explain the splitting of a node with an example. **[5]**

b) Give an algorithm to find the convex hull by Jarvis March Method. Explain the same with diagrams. **[5]**

Q8) a) Give a pointer doubling algorithm for addition of n numbers. Explain. **[5]** with figure. Comment on its complexity and the number of processors required.

b) Define and state the properties of Red-Black tree. Create the Red- Black tree for following data **[5]**

11, 21, 31, 41, 51, 61, 71, 81, 91

Total No. of Questions : 8]

SEAT No. :

P4204

[Total No. of Pages : 3

[5255]-702

M.E. (Information Technology)

ADVANCED OPERATING SYSTEM

(2013 Pattern) (Semester - I)

Time :3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Describe fork() system call for process creation with diagrammatic representation. of parent and child process's process control blocks. **[2]**

b) Discuss the working of dynamic storage allocation with detail focus on the working of slab allocation scheme. **[4]**

c) The VMM multiplexes system resources in virtual machine based systems. Describe the virtualization of different resources like processors and I/O devices to provide the environments for various guest operating systems. **[4]**

Q2) a) The operating system supports different strategies for thread based application developments one such strategy is scheduler activations. Discuss this strategy among the number of threads in a multiprocessor system. **[4]**

b) Explain about the user and kernel level thread contexts in brief. **[2]**

c) The POSIX threads library contains several routines for performing different operations. With clear descriptions of routines for thread creation and synchronization write a multithreaded program to perform arithmetic operations based on two integer numbers. **[4]**

P.T.O.

Q3) a) Describe Linear page table with suitable diagrammatic representation, also explain the working of VAX linear-page-table translation. **[4]**

b) Discuss the issues and techniques for the virtualization of virtual memory in a multiprocessor system. **[4]**

c) What is copy on write in association with the fork system call for process creation? **[2]**

Q4) a) Mention different models used for configuration of distributed systems. Prepare a comparative study of all the models, based on some factors used to describe advantages and disadvantages of these systems. **[4]**

b) Discuss various factors in brief due to which Distributed systems are considered as better than parallel systems. **[3]**

c) Describe scalability as one of the important features in the designing of distributed systems. Discuss the principles upon which a scalable distributed system can be designed. **[3]**

Q5) a) Discuss the basic issues associated with a system designed on the basis of message passing as an IPC mechanism. **[3]**

b) Distributed systems may affect with partial failures in the real working environment. Discuss different types of failures associated with such systems and what are the various consequences may occur because of such failures? **[3]**

c) Explain in brief about datagram in association with the message passing systems. Describe multidatagram messages and why they are used in Interprocess communication (IPC)? **[4]**

Q6) a) Describe consistency models for distributed shared memory systems. Discuss an example application in which causal consistency model is most suitably associated. **[4]**

b) Discuss a general application for which distributed shared memory abstraction is appropriately required. Also mention different design and implementation issues of DSM. **[4]**

c) Describe in brief about distributed shared memory abstraction used in the distributed computing systems. **[2]**

Q7) a) List out different features of a good global scheduling algorithm. Discuss at-least five such features with justification for using in a good global scheduling algorithm. **[5]**

b) Describe load leveling algorithms used for scheduling of resources in a distributed system. Distinguish between static versus dynamic load balancing algorithms in brief. **[5]**

Q8) a) What is microkernel based distributed systems? Discuss various goals and features of the AMOEBA distributed system in detail. **[5]**

b) Describe the system architecture of the AMOEBA system with detail descriptions of the hardware architecture. **[5]**

Total No. of Questions : 5]

SEAT No. :

P4205

[Total No. of Pages : 2

[5255]-703

M.E. (Information Technology)

RESEARCH METHODOLOGY

(2013 Pattern) (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 righit indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Enumerate conditions in which stratified sampling can be appropriately be used. Discuss how cluster sampling differs from stratified sampling. What are the similarities and dissimilarities between quota sampling and stratified sampling? **[6]**

b) Distinguish between Research methods and Research methodology. Briefly describe the different steps involved in a research process. **[4]**

Q2) a) Describe the techniques involved in defining a research problem. **[5]**

b) Explain the difference between random, systematic, stratified, cluster, and multistage sampling. **[5]**

Q3) a) State and explain features of well written abstract. **[4]**

b) A population is divided into three strata so that N 1= 5000, N2 = 2000, N3 = 3000 Respective standard deviations are: $\sigma l = 15$, $\sigma 2 = 18$ and $\sigma 3 = 5$.

How should a sample of size n = 84 be allocated to the three strata, if we want optimum allocation using disproportionate sampling design? **[6]**

P.T.O.

Q4) a) "Research is much concerned with proper fact finding, analysis and evaluation." Do you agree with this statement? Give reasons in support of your answer. **[5]**

b) Describe the importance of literature survey in scientific research. **[5]**

Q5) a) What do you mean by the term 'Randomization'? Indicate the methods of randomization and their advantages and limitations. **[4]**

b) Enumerate conditions in which stratified sampling can be appropriately being used. What are the similarities and dissimilarities between quota sampling and stratified sampling? **[6]**

Total No. of Questions : 8]

SEAT No. :

P4206

[Total No. of Pages : 2

[5255]-704

M.E. (Information Technology)

WIRELESS COMMUNICATION TECHNOLOGIES

(2013 Pattern)

Time :3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Assume suitable data if necessary.***
2) ***Answer any 5 out of 8 questions.***
3) ***Figures to the right indicate full marks.***

Q1) a) Explain the Architecture and components of a PRNET. **[5]**

b) Explain the working of On-Demand Distance Vector Routing Algorithm. **[5]**

Q2) a) Draw the architecture diagram of Wireless Sensor Node and explain its components. **[5]**

b) Describe the DSR routing. **[5]**

Q3) a) Explain DCMP with respect to: Mesh initialization phase. **[5]**

b) Explain advantages and disadvantages of Location Aided Routing Protocol. **[5]**

Q4) a) Explain in short Typel- update messages used in predictive location-based QOS routing protocol. **[5]**

b) What are different issues in Providing QOS in Ad hoc Wireless Networks? **[5]**

Q5) a) What is hard state receiver-initiated multicast protocol? Explain. **[5]**

b) Explain the routing protocol which uses a link-reversal algorithm and provides loop- free multicast path routes to destination node. **[5]**

P.T.O.

Q6) a) Explain Classification of Energy Management Schemes. **[5]**

b) What are different reasons TCP does not perform well in Ad Hoc Wireless Networks? **[5]**

Q7) a) Discuss INSIGNIA QOS Frameworks for Ad hoc Wireless Network. **[5]**

b) Explain advantages and disadvantages of TORA. **[5]**

Q8) a) Explain the battery management protocol, which tries to increase the lifetime of the nodes by exploiting the recovery capacity effect of battery. **[5]**

b) Explain requirements and issues for Security in Ad Hoc Wireless Networks. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4207

[Total No. of Pages : 2

[5255]-705

M.E. (Information Technology)

ADVANCED DATABASE SYSTEMS

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

Time :3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat figures must be drawn whenever necessary.***
3 ***Make suitable assumptions whenever necessary.***
4) ***Figure to the right indicate full marks.***

Q1) a) Explain Replication Transparency and Fragmentation Transparency. **[5]**

b) Explain Multidatabase system(MDBS) Architecture with a GCS. **[5]**

Q2) a) What is query processing? Explain layers of query processing. **[5]**

b) What do you mean by localization of distributed data. **[5]**

Q3) a) List lock based distributed concurrency control protocols and explain any one lock based concurrency protocol. **[5]**

b) Explain 2PC protocol actions with neat diagram. **[5]**

Q4) a) Explain in detail Failures in Distributed DBMS. **[5]**

b) Explain Write-Ahead Log (WAL) Protocol. **[5]**

Q5) a) Explain Intra-Operator Load Balancing in Parallel Database. **[5]**

b) Explain Database Cluster Shared-nothing Architecture for Parallel Database. **[5]**

P.T.O.

Q6) a) Explain Horizontal Class Partitioning Algorithm. **[5]**

b) Describe how the encapsulation is hidden from the end users when both the objects and the methods are distributed. **[5]**

Q7) a) Discuss data mining algorithm for Classification and clustering of customers for targeted marketing. **[5]**

b) Discuss Data Mining for Biological Data Analysis. **[5]**

Q8) a) Draw data warehouse architecture and explain in detail. **[5]**

b) Explain any one predictive data mining algorithm with example. **[5]**

● ● ●

Total No. of Questions : 8]

SEAT No. :

P4208

[Total No. of Pages : 2

[5255]-706

M.E. (Information Technology)

ADVANCE COMPUTER ARCHITECTURE

(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 Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) List out different categories of parallel processing systems. **[2]**

b) Describe Flynn's classification for different types of computer systems. Discuss MIMD & SIMD in detail. **[4]**

c) Discuss the components of the multiprocessor systems with clear descriptions on parallelism in the multiprocessor systems. **[4]**

Q2) a) Differentiate between data dependence and control dependence with example. **[4]**

b) Explain the concept of dynamic scheduling in ILP. **[2]**

c) Differentiate between data dependence and control dependence with example. **[4]**

Q3) a) Discuss the limitations on ILP for Realizable Processors. **[4]**

b) What is the difference between thread level and instruction level parallelism. Discuss about the performance of the system supporting thread level parallelism over ILP. **[4]**

c) Explain Hardware based speculation. **[2]**

P.T.O.

Q4) a) Explain cache coherency in association with multiprocessor systems in brief. **[4]**

b) Explain symmetric and shared memory architecture in detail. **[3]**

c) What is an Interconnection Network? Explain Buses and crossbar switches for Interconnection Networks. **[3]**

Q5) a) Explain about the use of cache memory in enhancement of the system performance. Discuss about the advanced optimizations of cache performance. **[4]**

b) Explain software and hardware multithreading. **[3]**

c) Explain design issues in multi-core architecture. **[3]**

Q6) a) How protection takes place in case of virtual memory? **[4]**

b) Explain Intel Multicore architecture with block diagram in detail. Discuss the types of applications most suitable for multicore systems in terms of efficient utilizations. **[4]**

c) What is Memory Technology? Explain SRAM technology. **[2]**

Q7) a) Explain Fine-grain and Coarse Grain SIMD architecture. **[5]**

b) Discuss the effectiveness of multicore systems for general purpose machines and application specific machines. Also explain IBM cell architecture with its block diagram. **[5]**

Q8) a) Explain Intel core DUO architecture with neat block diagram. Address the different multi-core issues in this architecture. **[5]**

b) Explain different types of cache used in multicore system organizations, with their respective block diagrams. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4209

[Total No. of Pages : 2

[5255]-707

M.E. (Information Technology)

INFORMATION ASSURANCE AND SECURITY

(2013 Pattern) (Semester - III)

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) What is Security Systems development Life Cycle? Justify its need. How it is different from software development life cycle? **[5]**

b) Explain with example three pillars of Information Security. **[5]**

Q2) a) Define : i) Ethics ii) Law iii) Authentication iv) VPN. **[4]**

b) Differentiate between application gateways and circuit gateways. **[6]**

Q3) a) What is privacy in an information security context? Give Example. **[3]**

b) Why is data the most important asset of an organization? State other assets in the organization that require protection? **[3]**

c) Explain various aspects to be considered by an organization for security planning. **[4]**

Q4) a) Explain various types of Access Controls. **[4]**

b) What measures can individuals take to protect against shoulder surfing? **[6]**

P.T.O.

Q5) a) What is a buffer overflow and how is it used against a Web server? **[4]**

b) What is information extortion? Describe how such an attack can cause losses with an example. **[6]**

Q6) a) Explain various types of security policies? **[3]**

b) What are the differences between a policy, a standard and a practice? **[3]**

c) Why do employees constitute one of the greatest threats to information security? **[4]**

Q7) a) Enlist and explain any six types of cyber crime. **[5]**

b) List and describe the three control strategies proposed for IDPS control. **[5]**

Q8) a) What is risk management? Why is the identification of risks, by listing assets and their vulnerabilities, so important to the risk management process? **[5]**

b) Discuss any two types of Firewall architectures. **[5]**

Total No. of Questions : 7]

SEAT No. :

P4210

[Total No. of Pages : 2

[5255]-708

M.E. (Information Technology)

NETWORK PROGRAMMING

(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 Calculator is allowed.***
5) ***Assume Suitable data tf necessary.***

Q1) a) Why must value-result arguments such as the length of a socket address structure be passed by reference? Explain with example. **[5]**

b) What address conversion functions does? Write the functions between ASCII strings and network byte ordered binary values. **[5]**

Q2) a) What will happen if multiple sockets have the same port? **[5]**

b) In a concurrent server, assume the child runs first after the call to fork. The child then completes the service of the client before the call to fork returns to the parent. What happens in the two calls to close in typical concurrent server. **[5]**

Q3) a) 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.**[5]**

b) Write and explain gethostbyname function of DNS. **[5]**

P.T.O.

Q4) a) How two clients from IPv4 and IPv6 communicate with IPv6 server? **[5]**

b) What happen on Crash, Reboot, and Shutdown of TCP server host? **[5]**

Q5) a) How ioctl function works in network programs? **[5]**

b) What is the largest length that we can pass to sendto for a UDP/IPv4 scoket, that is, what is the largest amount of data that can fit into a UDP/IPv4 datagram? What changes with UDP/IPv6? **[5]**

Q6) a) Getnameinfo can take a long time (up to 80 seconds) to return an error if a hostname cannot be found for an IP address. Write a new function named getnameinfo_tim that takes an additional integer argument specifying the maximum number of seconds to wait for a reply. If the timer expires and the NI-NAMEREQD flag is not specified, just call inet - ntop and return an address string. **[5]**

b) Give the distinction between thread and fork with suitable examples. **[5]**

Q7) a) Give a detail note on TCP Iterative Server. **[5]**

b) 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.**[5]**

Total No. of Questions : 8]

SEAT No. :

P4211

[Total No. of Pages : 3

[5255]-709

M.E. (Chemical)

MATHEMATICAL AND STATISTICAL METHODS

(2013 Pattern) (Theory)

Time :3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer five out of 8 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks***

Q1) a) Solve the differential equation using power series **[6]**

$$y' - y = 0$$

$$y'' + 9y = 0$$

b) Solve the following Legendre's equation using power series **[4]**

$$(1 - x^2)y'' - 2xy' + n(n+1)y = 0$$

Q2) Convert the Laplace equation in polar coordinates **[10]**

$$\nabla^2 u = \frac{d^2u}{dx^2} + \frac{d^2u}{dy^2}$$

Take $x = r\cos\theta$ and $y = r\sin\theta$

Q3) a) The heights of men in a city are normally distributed with mean 171 cm and SD 7 cm, while the corresponding values for women in the same city are 165 cm and 6 cm respectively. If man and women are chosen at random from city, find the probability that the woman is taller than man.**[5]**

P.T.O.

b) The standard deviation of random sample of 1000 is found to be 2.6 and the standard deviation of another random sample of 500 is 2.7. Assuming the samples to be independent. Find whether the two samples could have come from population with same standard deviation. Take $Z\alpha = 1.96$. **[5]**

Q4) a) The following mistakes per page were observed in a book. Fit the Poission distribution to fit data **[5]**

No of mistakes per page	0	1	2	3	4
No of times the mistakes occurred	211	90	19	5	0

b) Suppose that a manufactured product has 2 defects per unit of product inspected, using Poission distribution, calculate the probabilities of finding the product without any defect, 3 defect, and 4 defect. **[5]**

Q5) a) Calculate first four moments about the mean and also the value of β_1 and β_2 from the following data : **[6]**

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No of Students	8	12	20	30	15	10	5

b) Write note on i) Central and non-central moments, ii) Dispersion **[4]**

Q6) a) Find the rank correlation for the following data. **[4]**

x	1	6	5	10	3	2	4	9	7	8
y	6	4	9	8	1	2	3	10	5	7

b) Find the line of regression of i) y on x and ii) x on y **[6]**

x	1.53	1.78	2.6	2.95	3.42
y	33.5	36.3	40.0	45.8	53.5

Q7) a) A study of prices at Chennai and Pune are given below :

	Chennai	Pune
Mean	19.5	17.75
S.D.	1.75	2.5

Also the coefficient of correlation between the two 0.8. Estimate the most likely price of rice i) at Chennai corresponding to the price of 18 at Pune and ii) at Pune corresponding to the price of 17 at Pune. **[7]**

b) Write note on Randomised block design. **[3]**

Q8) Analyze the variance in the following Latin square yield of paddy where A, B, C, D denote the difference methods of cultivation. Examine whether the difference methods of cultivation have given significantly different yields.

Take $F_{5\%}$ (V_1=3, V_2=6) = 4.76 **[10]**

A122	B121	C123	B122
B124	C123	A122	D125
A120	B119	D120	C121
C122	D123	B121	A121

● ● ●

Total No. of Questions : 8]

SEAT No. :

P4212

[Total No. of Pages : 3

[5255]-710

M.E. (Chemical)

PROCESS OPTIMIZATION

(2013 Pattern) (Theory)

Time :3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer total five questions from following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data, if necessary.***

Q1) a) Find whether the following function is strictly convex/strictly concave $f(x) = 4x_1^2 + 7x_1x_2 + 9x_1 - 7x_2 - 8x_2^2 + 9$. **[5]**

b) Write a note on-Determination of convexity and concavity. **[3]**

c) Explain the Conditions of sufficiency. **[2]**

Q2) a) State the quadratic forms are positive definite, negative definite or neither. **[5]**

i) $f = x_1^2 + 2x_2^2$

ii) $f = -x_1^2 + 4x_1x_2 + 4x_2^2$

b) Write a note on-Applications of convexity. **[3]**

c) Define feasible region. **[2]**

Q3) a) Explain the Simplex Search Method and demonstrate for minimization of $f(x) = x_1^2 + x_2^2 + 3$ starting at $(x^0)^T = [2\ 1]$ in the direction $s^0 = [-2\ 2]^T$. Perform 2 steps. **[5]**

P.T.O.

b) Find whether the given direction s at the point x is descent for the function $f(x_1, x_2, x_3) = (x_1 + 2x_2 + 3x_3)^2 - 5(x_{12} + x_3)^2 \;\; s = (1, 2, -1)^T, \;\; x = (1, 0, 1)^T$. **[3]**

c) Write a note on-Box's Evolutionary Optimization method. **[2]**

Q4) a) Minimize $f(x) = \dfrac{(x_1 - 2)^2}{36} + \dfrac{(x_2 - 3)^2}{16} - 1$

subject to linear constraint s

$x_1 \geq 0, \;\; x_2 \geq 0, \;\; 2 - x_1 - x_2 \geq 0, \;\; -3 + 3x_1 - x_2 \leq 0$. Use Simplex method. **[5]**

b) Find whether the point is $(3, 2)^T$ Kuhn-Tucker point. **[3]**

c) Write a note on - Log Penalty term. **[2]**

Q5) a) Differentiate between direct and indirect methods for constrained optimization techniques. **[5]**

b) Write a short note on-Constrained optimization. **[3]**

c) How to identify an active constraint during numerical optimization? **[2]**

Q6) a) Write the advantages of Genetic Algorithm over traditional methods of optimization. **[5]**

b) Explain 'reproduction' operator in Genetic Algorithm. **[3]**

c) Explain the selection of the length of the binary string to represent a design variable. **[2]**

Q7) a) Minimize $f(x) = 2x^2 + 12 / x$. Use Fibonacci Search Method, Write complete algorithm for these methods and perform 2 steps towards finding optimized solution for the above function. **[5]**

b) Internal halving Method.

Write complete algorithm for this method and demonstrate at least 2 steps towards finding optimized solution for the above function. **[5]**

Q8) a) Minimize $f(x) = 10x^5 - 2x^4 + 5x + 40$ in the interval [–8 8]. Use Secant Method. Write complete algorithm for this method and perform 2 steps towards finding optimized solution for the above function. **[5]**

b) Minimize $f(x) = x^2 + (3 / (1 + x))$ .Use Newton Raphson Method. Write complete algorithm for this method and demonstrate at least 2 steps towards finding optimized solution for the above function. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4213

[Total No. of Pages : 2

[5255]-711

M.E. (Chemical Engineering)

ADVANCED SEPARATION PROCESSES

(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) Discuss details of spiral wound module with typical schematic diagram? Also discuss comparison of module configuration. **[10]**

Q2) A solution of raffinose containing 100 g/l of NaCl is to be dialysed in a shell-and-tube type of hollow-fiber dialyzer operating counter-currently. With a dialyzer having 1000 cm^2 area of membranes the dialysis coefficient for NaCl was determined to be 0.0415 cm/min, when the feed rate was 200 cm^3/min, and the flow rate of pure water was 500 cm^3/min. If 90% of the salt is to be removed, what area of the hollow-fiber membranes will be needed, if the same flow rates for feed and water are used? **[10]**

Q3) Describe the design aspects of reverse osmosis and microfiltration membrane processes. **[10]**

Q4) Describe brief about classification of various chromatographic techniques? Describe HPLC with principle, working mechanism along with typical schematic diagram? **[10]**

Q5) Describe the classification of membrane separation processes along with the Design aspects of Pervaporation and Permeation techniques for liquids and gases. **[10]**

P.T.O.

Q6) a) Explain Adductive crystallization. **[5]**

b) What are different types of adsorption isotherms? **[5]**

Q7) a) Explain Supercritical fluid extraction. **[5]**

b) Write a note on oil spill management. **[5]**

Q8) a) Discuss the reactive absorption for removal of hazardous gases like H_2S, SOx? **[5]**

b) Write a note on emulsion liquid membranes. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

P4424

[Total No. of Pages : 2

[5255]-712

M.E. (Chemical)

RESEARCH METHODOLOGY

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

Time :3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Solve any 5 questions.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume Suitable data if necessary.***
4) ***Take a sample case study to prove your point of explaination.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) How information technology enabled services have helped in the literature gathering / searching/ storing /retrieving the information. Discuss in the details. **[10]**

Q2) Can a software programme be patented? Describe the circumstances/situation in which it is possible. **[10]**

Q3) What is the role of statistics in the overall success of research problem? Take a case study of your choice and describe. **[10]**

Q4) In an experiment based research what are various sources of errors? What are the types of the errors? Take a case study of your choice and describe. **[10]**

Q5) What are process patents? Describe various advantages of getting them. Take a case study of your choice and describe. **[10]**

P.T.O.

Q6) What is ANOVA? How it is useful in improving effectiveness of research experiment? Take a case study of your choice and describe. **[10]**

Q7) What are fuzzy logic system? Where they have their utility the most? Cite one example from chem. Engg. field and explain. **[10]**

Q8) What is repeatability of an experiment? Justify its use in research output analysis. Take a case study of your choice and describe. **[10]**

● ● ●

Total No. of Questions : 8]

SEAT No. :

P4214

[Total No. of Pages : 3

[5255]-713

M.E. (Chemical)

ADVANCED TRANSPORT PHENOMENA

(2013 Pattern) (Theory)

Time :3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer 5 questions from 8 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronics calculator is allowed.***
4) ***Assume suitable data, if necessary.***
5) ***Use equations in appendix wherever necessary.***

Q1) a) Derive the equation for velocity profile for flow of two adjacent immiscible fluids. **[7]**

b) Write short note on the substantial time derivative and expression of equation of motion in terms of substantial time derivative. **[3]**

Q2) a) Determine the temperature distribution in an incompressible liquid confined between two coaxial cylinders, the outer one of which is rotating at steady angular velocity Ω_0 and radius ratio K to be fairly small so that the curvature of the fluid streamlines must be taken into account. The temperatures of the inner and outer surfaces of the annular region are maintained at T_k and T_1 respectively, with $T_k \neq T_1$. Assume steady laminar flow and neglect the temperature dependence of the physical properties. **[6]**

b) Summarize all the steps required in obtaining the equation of change for the temperature. **[4]**

Q3) A common method for determining the mass rate of flow through a pipe is to measure the pressure drop across some 'obstacle' in the pipe. An example of this is the orifice which is a thin plate with hole in the middle. There are pressure taps at plane 1 and 2, upstream and downstream of the orifice plate. The velocity profile at plane 1 will be assumed to flat while at plane 2 use macroscopic balance for developing expressions for velocity and mass flow rate profiles. **[10]**

P.T.O.

Q4) a) Obtain the equation of continuity for a multi-component mixture. Assume binary system with constant p^{DAB}, with constant C^{DAB} or with zero velocity. **[6]**

b) Explain boundary layer separation and formation of wakes. **[2]**

c) Explain effective thermal conductivity of composite solids. **[2]**

Q5) a) Write the short note on time smooth temperature. **[4]**

b) A solid body occupying the space from y = 0 to y = ∞ is initially at temperature T_0. Beginning at time t = 0, a periodic heat flux given by

$$q_y = q_0 \cos wt = q_0 R[e^{iwt}]$$

is imposed at y = 0. Here q_0 is the amplitude of the heat flux oscillations and w is the frequency. It is desired to find the temperature in this systems, T(y, t) in the 'periodic steady. **[6]**

Q6) a) In a catalytic tubular reactor, a dilute solution of solute A in a solvent S is in fully developed laminar flow in the region z<0. When it encounters the catalytic wall in the region 0<z<L, solute A is instantaneously and irreversible rearranged to an isomer B. Write diffusion equation appropriate for this problem and find the solution for short distances into the reactor. Assume that the flow is isothermal and neglect the presence of B. Use the following equations: **[5]**

$$v_z \frac{\partial C_A}{\partial z} = D_{AS} \left| \frac{1}{r} \frac{\partial}{\partial r} \left(r \frac{\partial C_A}{\partial r} \right) + \frac{\partial^2 CA}{\partial z^2} \right|$$

b) A semi-infinite body of liquid with constant density and viscosity is bounded by horizontal surface. Initially the fluid and the solid are at the rest. Then at time t = 0, the solid surface is set in motion in the positive x direction with velocity v_0. Find the velocity v_x as a function of y and t. There is no pressure gradient or gravity force in the x direction and the flow is presumed to be laminar. **[5]**

Q7) a) Derive the expression for the mass flux for diffusion with a heterogeneous chemical reaction. **[7]**

b) Derive the expression for macroscopic mass balances. **[3]**

Q8) a) Derive the expression for temperature distribution more than one independent variables. **[6]**

b) Estimate the maximum diameter of micro-spherical catalyst particles that could be lost in the stack gas of a fluid cracking unit under the following conditions :

Gas velocity at axis of stack = 1.0 m/s (vertically upward)

Gas Viscosity = 0.026 cp

Gas density = 0.045 kg/m^3

Density of catalyst particles = 1.2 g/cm^3

Express the results in microns? **[4]**

Total No. of Questions : 8]

SEAT No. :

P4215

[Total No. of Pages : 3

[5255] - 714
M.E. (Chemical Engineering) (End Semester)
ADVANCED PROCESS CONTROL
(2013 Pattern)

Time : 3 hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) Derive state space model matrix equations for the irreversible reaction $A \rightarrow B$ taking place in two perfectly mixed reactors connected in series. The reaction rate is proportional to the concentration of reactant. Let C_{A1} and C_{A2} are the concentrations of A in tank 1 and tank 2 respectively. The concentration of A in feed is C_{A0}. The feed flow rate is F. Both C_{A0} and F can be manipulated. Assume specific reaction rate constants k_1 and k_2 in each tank to be constants. Further, assume that the reactor is with isothermal operation. **[5]**

b) Write theoretical model for three heated tanks in series. **[5]**

Q2) a) What are principle control considerations that affect the scope of mathematical modelling of Chemical process. **[5]**

b) Develop the block diagram of a generalised feedback control system with one disturbance incorporating in each block the appropriate transfer function and on each stream appropriate variable. **[3]**

c) Define empirical modelling. **[2]**

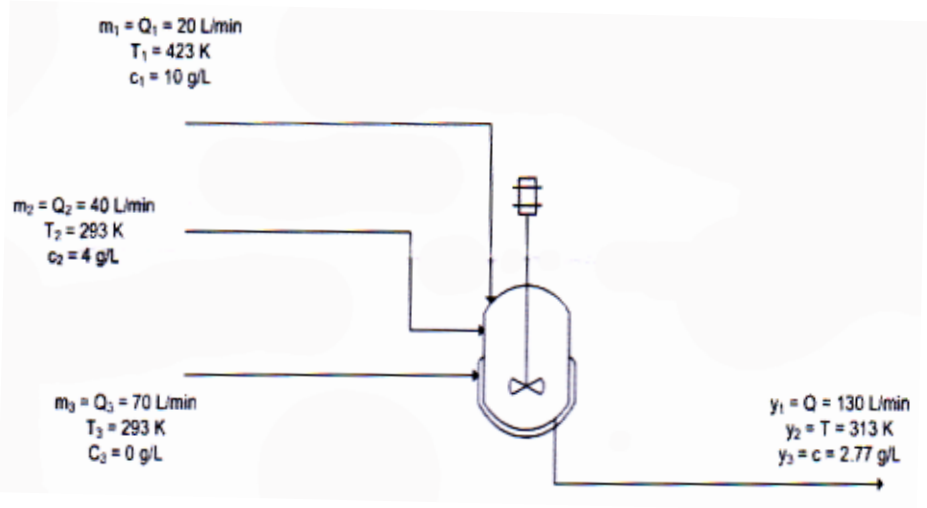
Q3) a) What are principle questions that arise during the design of feedback controller? Discuss them on the basis of physical example. **[5]**

b) What is adaptive control and why is it needed in Chemical Process Control? **[3]**

c) Give two examples of adaptive control for processing units in chemical plants. **[2]**

P.T.O.

Q4) a) Consider the following blending system.



The equations used to model the system are:

$$y_1 = m_1 + m_2 + m_3$$

$$y_2 = \frac{T_1 m_1 + T_2 m_2 + T_3 m_3}{y_1} = \frac{T_1 m_1 + T_2 m_2 + T_3 m_3}{m_1 + m_2 + m_3}$$

$$y_3 = \frac{c_1 m_1 + c_2 m_2 + c_3 m_3}{y_1} = \frac{c_1 m_1 + c_2 m_2 + c_3 m_3}{m_1 + m_2 + m_3}$$

Calculate the RGA using the steady - state gain matrix method. **[5]**

b) What do you mean by the term decoupling two control loops? Explain why and how it is done? **[3]**

c) What is a main criticism of RGA? **[2]**

Q5) a) Write short note on step response identification and impulse response identification in case of empirical modelling and process intensification. **[5]**

b) Explain the meaning of controllability and observability in multiple loop control system. Use suitable diagram and example. **[5]**

Q6) a) What determines Bounded - Input - Bounded - Output (BIBO) stability of a linear multivariable system whose model is given in the state - space form? **[5]**

b) What is the relative gain array (RGA); what is it used for? **[3]**

c) What is the Niederlinski index? **[2]**

Q7) a) What is plant wide control system? Explain in detail. **[5]**

b) Why is a single element of the RGA sufficient to determine the entire array for a 2×2 system? **[5]**

Q8) a) What is Z transform? Explain the importance of it in the digital control system. **[5]**

b) What is digital signal and what is an analog signal? Identify their differences and discuss how one can be converted to another. **[3]**

c) Define and explain sampler in short. **[2]**

Total No. of Questions : 8]

SEAT No. :

P4216

[Total No. of Pages : 3

[5255] - 715
M.E. (Chemical)
ADVANCED REACTION ENGINEERING
(2013 Pattern) (Theory)

Time :3 hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer total 5 questions from following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Discuss various classes of industrial reactions and their representative catalysts. **[5]**

b) Describe the steps that take place in a typical catalytic reaction, with a schematic diagram. **[5]**

Q2) a) Postulate models for dissociative and non-dissociative adsorption of CO on metal surfaces. Derive the expression for Langmuir adsorption isotherm, assuming non- dissociative (or, molecular) adsorption. **[5]**

b) Explain single - site, dual - site, and Eley - Rideal mechanisms for surface reactions. **[5]**

Q3) a) State and explain the analogous transport laws for conductive heat transfer,momentum transfer, and mass transfer, in terms of a relationship between the overall flux and the corresponding transport gradient. **[5]**

b) Focus on the mass transfer flux, and arrive at the two expressions for overall molar flux of A, N_A, one in terms of the mole fraction of A, y_A, and the other in terms of the concentration of A, C_A. From these expressions, evaluate the overall molar flux for the following cases: (i) Equi-molar Counter Diffusion, (ii) Dilute Concentrations. **[5]**

Q4) a) Explain briefly the mechanisms of catalyst deactivation. **[4]**

P.T.O.

b) Calculate the mass flux of reactant A to a single catalyst pellet 1 cm in diameter suspended in a large body of liquid. The reactant is present in dilute concentrations and the reaction is considered to take place instantaneously at the external pellet surface (i.e., $C_{AS} \approx 0$). The bulk concentration of the reaction is 1.0 M, and the free - system liquid velocity is 0.1 m/s. The kinematic viscosity is 0.5 centistoke (cS: 1 cS = 10^{-6} m^2/s), and the liquid diffusivity of A is 10^{-10} m^2/s. T = 300K. **[6]**

Q5) a) Derive expression for overall Effectiveness factor for a first order reaction carried out for a solid catalytic reaction? **[5]**

b) Write the mass transfer coefficient in packed beds? **[3]**

c) Write a short note on Multiphase reactors? **[2]**

Q6) a) Derive the differential equation involved for the diffusional mass transport in the spherical catalyst pellet with surface concentration C_{AS} with first order reaction $A \rightarrow B$ occurring inside the catalyst pellet with first order kinetics k_1. Take usual notations for the terms involved. **[5]**

b) Catalyst pellet internal effectivenes factor ,η, is defined as the ratio of the actual overall rate of the reaction to the actual overall rate the catalytic reaction if the entire interior catalytic surface of the pellet is at the external pellet surface conditions, i.e., C_{As} and T_s. From the above definition, derive the following expression for the effectiveness factor for a first order reaction in a spherical porous catalyst pellet. **[5]**

$$\eta = \frac{3}{\varphi_1^2}(\varphi_1 \coth \varphi_1 - 1)$$

Q7) A first - order heterogeneous irreversible reaction is taking place within a spherical catalyst pellet, which is plated with platinum throughout the pellet. The reactant concentration halfway between the external surface and the center of the pellet (i.e., r = R/2) is equal to one-tenth the concentration of the pellet's external surface. The concentration at the external surface is 0.001 mol/dm^3, the diameter (2R) is 2 x 10^{-3} cm, and the diffusion coeffcient is 0.1 cm^2/s.

a) What is the concentration of reactant at a distance of 3 × 10^{-4} cm in from the external? Pellet surface? **[5]**

b) To what diameter should the pellet be reduced if the effectiveness factor is to be 0.8? **[5]**

Q8) A sample of tracer hytane at 320 K was injected as a pulse to the reactor, and the effluent concentration was measured as a function of time, resulting in the following data.

Time (min)	0	1	2	3	4	5	6	7	8	9	10	12	14
C (g/m^3)	0	1	5	8	10	8	6	4	3	2.2	1.5	0.6	0

The measurements represent the exact concentrations at the times listed and not the average values between the various sampling tests.

a) Construct figures showing C (t) and E(t) as functions of time. **[3]**

b) Determine the fraction of material leaving the reactor that has spent between 3 and 6 min in the reactor. **[4]**

c) Calculate the mean residence time of the distribution. **[3]**

Total No. of Questions : 8]

SEAT No. :

P4217

[Total No. of Pages : 2

[5255] - 716
M.E. (Chemical)
PROCESS MODELING & SIMULATION
(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) ***Assume suitable data if, necessary.***
4) ***Use of logarithmic table slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.***

Q1) Write short notes on: **[10]**

a) Equation of state

b) Transport laws.

Q2) Derive the equations describing the Batch distillation column with constant hold up. **[10]**

Q3) Write the model equations involved in a Batch reactor when it is in the cooling phase with a neat diagram. **[10]**

Q4) Explain optimization with suitable example. **[10]**

Q5) A cup of coffee has an initial temperature of 74°C, but cools to 68°C in one minute when placed in a room with a temperature of 21°C. Let Tn be the temperature of the coffee after 'n' minutes (a) Write a difference equation which describes the change in temperature of the coffee from minute to minute (b) solve the resulting difference equation. **[10]**

P.T.O.

Q6) Explain about sequential modular approach with a neat flow chart in process plant simulation. **[10]**

Q7) Describe the simulation of Batch reactor using Runge - kutta method. **[10]**

Q8) Discuss the simulation of Non-isothermal CSTR using Euler's method. **[10]**

Total No. of Questions : 8]

SEAT No. :

P4218

[Total No. of Pages : 2

[5255] - 717
M.E. (Chemical Engineering)
ADVANCED THERMODYNAMICS
(2013 Pattern) (Semester - III)

Time :3 hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) Give the NRTL equations and explain all the terms. What are the advantages and limitations of NRTL model? **[5]**

b) What are the advantages of Wilson model? Explain the equations in detail. **[5]**

Q2) a) What parameters affect the equilibrium constant for a gaseous phase reaction? Derive the relevant equations. **[4]**

b) The water shift reaction.

$$CO\ (g) + H_2O\ (g) \longrightarrow CO_2\ (g) + H_2\ (g)$$ **[6]**

is carried out the under the different sets of conditions described below. Calculate the fraction of stream reacted in each case. Assume mixture behaves as an ideal gas.

i) The reactants consist of 2 mole of H_2O vapor and 3 mol of CO. The temperature is 1100K and the pressure is 1 bar.

ii) The reactants contain 2 mole of H_2O and 2 mol of CO. other conditions are the same in (a)

iii) The initial mixture consists of 1 mol of H_2O, 1 mol of CO and 2 mol of CO_2. other conditions are the same of (a).

P.T.O.

Q3) a) Develop the following thermodynamic properties in terms of partition functions Heat capacity and enthalpy. **[5]**

b) What is the probability that two moles of water originally at 50°C will spontaneously separate into 1 mole of water at 49°C and 1 mole water at 51°C. $C_p = 75JK^{-1}/mol$ **[5]**

Q4) a) Explain the limiting law and the Ionic strength of electrolytes. **[5]**

b) Develop correlation for activity and activity coefficient for symmetrical strong electrolytes. **[5]**

Q5) a) Explain the concepts of uncompensated haet and rate of entropy production. **[5]**

b) Explain in detail chemical affinity and De-Donder inequality. Write the First Law of Thermodynamics for a system in which reaction is occurring in terms of the chemical variabel. **[5]**

Q6) a) A rubber band stretches when a weight is hung on it. If hot air is blown on the streched rubber band it is observed that it contracts. Explain the phenomenon. **[5]**

b) Explain the three types of order and disorder transitions. **[5]**

Q7) a) Explain second order transitions with examples. **[5]**

b) Derive the expression for surface tension (γ) in terms of partial derivatives of various thermodynamic properties. **[5]**

Q8) Explain the thermodynamics of biological systems in detail. **[10]**

Total No. of Questions : 8]

SEAT No. :

P4219

[Total No. of Pages : 2

[5255] - 718
M.E. (Environmental Engineering)
APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERS
(2013 Pattern) (Semester - I)

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 in allowed.***
6) ***Assume suitable data, if necessary.***

Q1) a) Obtain the rank correlation coefficient between the variables X and Y from the following pairs of observed values. **[5]**

X	50	55	65	50	55	60	50	65	70	75
Y	110	110	115	125	140	115	130	120	115	160

b) Explain mean deviation with suitable example. **[5]**

Q2) a) The variable X and Y are connected by the equation aX + bY + c = 0. Show that the correlation between them is –1 If the signs of a and b are alike and +1 if they are different. **[5]**

b) Discuss the procedure for calculating the mean from ungrouped data. **[5]**

Q3) a) Discuss relation between moments about mean in terms of moments about any point. **[5]**

b) Find the covariance of the two random variables whose joint density is given by

$$f(x,y)=\begin{cases}2 \text{ for } x>0, y>0, x+y<1\\ 0 \quad \text{elsewhere}\end{cases}$$ **[5]**

P.T.O.

Q4) a) Explain merits and limitations of R type factor analyses related to maximum liklihood method of factor analysis in detail. **[5]**

b) A random sample of n = 100 is taken from a population with $\sigma = 5.1$. Given that the sample mean is $X_{mean} = 21.6$, Construct a 95 % confidence interval for the population mean μ. **[5]**

Q5) a) Discuss the types of factorial design. **[5]**

b) Elaborate model equation for latin square design. **[5]**

Q6) a) What is multiple regression. **[5]**

b) Explain stepping stone method. **[5]**

Q7) a) Explain stratified sampling and systematic sampling. **[5]**

b) What are unbound solutions in simplex method. **[5]**

Q8) a) Explain degeneracy in simplex method. **[5]**

b) What are the basic steps in constructing a linear programming model. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4220

[Total No. of Pages : 2

[5255] - 719
M.E. (Environmental Engineering) (Chemical)
ENVIRONMENTAL MANAGEMENT
(2013 Pattern)

Time :3 hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Your answer will be be valued as a whole.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables are allowed.***
6) ***Assume suitable data if necessary.***

Q1) a) What are the advantages of environmental auditing. **[5]**

b) Discuss various environmental management tools in detail. **[5]**

Q2) a) Explain evoluation of EIA in India. **[5]**

b) What is 74^{th} amendment of the constitution. **[5]**

Q3) a) What are the features of the directive principles of state policy. **[5]**

b) Explain socio - economic aspects of sustainable development. **[5]**

Q4) a) Explain command and control regulations related to environmental polices. **[5]**

b) How a rule is notified or Gazetted. **[5]**

Q5) a) What is eco-mapping. **[5]**

b) Explain fundamental rights and duties of Indian Citizen. **[5]**

P.T.O.

Q6) a) Explain the stesp in rule notification. **[5]**

b) Enlist different factory act passed by Indian porliament. **[5]**

Q7) a) What is carbon trading. **[5]**

b) What is the role of state pollution control board for sustainable growth. **[5]**

Q8) a) Explain the major role played by ministry of environment and forests in conservation of Environment. **[5]**

b) What are the salient features of the annual report of Environment and forest for the current year. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4221

[Total No. of Pages : 1

[5255] - 720
M.E. (Chemical - Environmental Engg.)
ENVIRONMENTAL CHEMISTRY
(2013 Pattern)

Time :3 hours] ***[Max. Marks :50***

Instructions to the candidates:

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

Q1) Explain First order reactions with proper example. **[10]**

Q2) Explain the coagulation with suitable example. **[10]**

Q3) What is greenhouse effect explain with neat figure. **[10]**

Q4) What are the ill effects of particulate matter on vegetation? **[10]**

Q5) How to remove the Metals from wastewater by using Fenton process? **[10]**

Q6) Explain chemical and photochemical reactions. **[10]**

Q7) How the synthesize Nano materials? **[10]**

Q8) How to do the Reclamation of contaminated land. Explain it for Oil industry? **[10]**

Total No. of Questions : 8]

SEAT No. :

P4222

[Total No. of Pages : 2

[5255] - 721
M.E. (Chemical) (Environment Engineering)
RESEARCH METHODOLOGY
(2013Pattern) (Credit System)

Time :3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Solve any five full questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Write a note on "Process for patenting a reseach ideal". **[5]**

b) Write a note on Errors in selecting a research problem. **[5]**

Q2) a) What are the typical financial needs of a research project on a process modification of a known chemical process? **[5]**

b) Which are different research funding agencies? Discuss about any one in detail. **[5]**

Q3) a) Every rupee spent on research has to be recovered from the market. Discuss various methods of this recovery. **[5]**

b) Write a note on Individual research Proposal & Institutional research proposal. **[5]**

Q4) a) Write a note on 'Pollution free technologies'. **[5]**

b) What are the types of data? Describe qualitative methods of data collection. **[5]**

Q5) a) Write a note on 'Mathematical modeling advancement'. **[5]**

b) Write a note on discriminant and cluster analysis. **[5]**

P.T.O.

Q6) a) Explain the significance of a research report and brief the various steps involved in writing such a report. **[5]**

b) What are different types of reports? Why report writing is essential? **[5]**

Q7) a) Explain the difference between Research methods and Research methodology. **[5]**

b) Discuss the steps involved in publishing a research article. **[5]**

Q8) a) What do you mean by researching? Describe the types of research. **[5]**

b) Write a note on "interdisciplinary research". **[5]**

Total No. of Questions : 8]

SEAT No. :

P4223

[Total No. of Pages : 2

[5255] - 722
M.E. (Environmental Engineering) (Chemical)
WASTEWATER TREATMENT AND DESIGN
(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 answer 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) Explain various types of reactions. **[5]**

b) Explain two film theory for gas liquid interface. **[5]**

Q2) a) Determine the theoretical power requirement to achieve a G value of 100 /S in a tank with a volume of 2800 m^3. Assume that the water temperature is 15°C. What is the corresponding value when the water temperature is 5°C, μ at 5°C is 1.518×10^{-3} N-S/m^2 and μ at 15°C is 1.39×10^{-3} N-S/m^2 **[5]**

b) Discuss the design criteria for grannular medium filter. **[5]**

Q3) a) Explain TSA in the process of adsorption. **[5]**

b) What is breakthrough curve. **[5]**

Q4) a) Discuss general features of a conventional rapid granular medium depth filter. **[5]**

b) State and explain principle and mechanisms of filtration. **[5]**

P.T.O.

Q5) a) How activated carbon is prepared and explain carbon regeneration and reactivation. **[5]**

b) What do you mean by ideal disinfectant. **[5]**

Q6) a) Explain process kinetics for biological treatement process. **[5]**

b) What are the biological properties of waste. **[5]**

Q7) a) Discuss various types of anaerobic reactors. **[5]**

b) What are the objectives of biological treatement and state its limitations. **[5]**

Q8) a) Discuss general design considerations for anaerobic treatment processes. **[5]**

b) Explain principle and working of trickling filter. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4224

[Total No. of Pages : 1

[5255] - 723
M.E. (Chemical) (Environmental Engg.)
SOLID WASTE MANAGEMENT
(2013 Pattern)

Time :3 hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) Describe solid waste management in detail. **[10]**

Q2) Discuss the methods adopted in India for collection and disposal of solid waste. **[10]**

Q3) Discuss on typical material recovery. How the sorting operations are carried out? **[10]**

Q4) Discuss Biomethanation. **[10]**

Q5) Write , what is meant by Pyrolysis in detail? **[10]**

Q6) Describe the possibilities in solid waste management with respect to reduction, reuse and recovery. **[10]**

Q7) Outline , how to minimize leachate generation in a sanitary landfill? **[10]**

Q8) Describe & list the various environmental legislation for municipal solid waste. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P4225

[Total No. of Pages : 1

[5255] - 724
M.E. Chemical (Environmental Engg.)
INDUSTRIAL WASTE TREATMENT
(2013 Pattern)

Time :3 hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) What is effluent. Explain role of Good Housekeeping in industrial waste Treatment. **[10]**

Q2) Explain the Equalization. **[10]**

Q3) Discuss the Treatment techniques for removal oil in industrial wastewaters. **[10]**

Q4) What are the tertiary treatments available for industrial waste? **[10]**

Q5) Explain the cost benefit analysis for CETP? **[10]**

Q6) Write the Classification of industries according to pollutants. **[10]**

Q7) Explain the types of water pollutants in detail. **[10]**

Q8) Explain the wastewater treatment for steel industry. **[10]**

Total No. of Questions : 8]

SEAT No. :

P4226

[Total No. of Pages : 2

[5255] - 725
M.E. (Chemical Environmental Engineering)
REMOTE SENSING AND GIS APPLICATIONS IN ENVIRONMENTAL ENGINEERING
(2013 Pattern) (Semester - III)

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

Q1) a) Explain Active and Passive Remote Sensing system. **[4]**

b) What is the principle of Remote sensing and its application? What are the different stages of Remote Sensing? **[6]**

Q2) a) With a schematic diagram of EMR process, explain EMR interaction with earth's surface. **[5]**

b) What is electromagnetic spectrum and explain electromangnetic spectum with necessary sketch. **[5]**

Q3) Describe active system of data acquisition and explain any two basic types of radar. **[10]**

Q4) a) What is FCC and explain its significance in identification of surface objects? **[4]**

b) Explain the application of aerial photograph in soil mapping of a region.**[6]**

Q5) a) What is the necessity of image enhancement and explain contrast enhancement. **[4]**

b) What is Digital imaging processing its necessity and application? Explain the Rediometric correction method. **[6]**

P.T.O.

Q6) a) What is GIS and explain its different components. **[5]**

b) What is Spatial referencing and their types and explain Universal Transverse Mercator. **[5]**

Q7) a) What are the different hardware and software used in GIS application. **[6]**

b) Explain

i) Raster model and

ii) Vector model **[4]**

Q8) a) Differentiate between spatial data and non spatial data. **[5]**

b) Explain Watershed management by using Remote sensing and GIS. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4227

[Total No. of Pages : 2

[5255] - 726

M.E. (Chemical) (Environmental Engineering)

INDUSTRIAL POLLUTION PREVENTION & CLEANER PRODUCTION

(2013 Pattern) (Semester - III)

Time :3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt any 5 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Discuss the industrialization and sustainable development. **[5]**

b) State the different indicators of the sustainability? **[5]**

Q2) a) What are new environmental policies and regulations to encourage pollution prevention. **[5]**

b) Explain the cleaner technology and cleanerproduction concept. **[5]**

Q3) a) Discuss historical evolution of pollution prevention and control. **[5]**

b) Explain the role of industries and Government in pollution prevention and control. **[5]**

Q4) a) Write a brief note on source reduction techniques in pollution control in chemical industries. **[5]**

b) Explain the use of Internet information for pollution prevention & cleaner production. **[5]**

Q5) Justify that the process and equipment optimization is important aspect in pollution prevention & cleaner production. **[10]**

P.T.O.

Q6) Discuss the technical and environmental feasibility analysis as well as total cost analysis of pollution prevention & cleaner production program. **[10]**

Q7) a) Discuss the Environmental Management system (EMS) **[5]**

b) Write a note on Environmental Audit. **[5]**

Q8) Write short notes on:

a) Elements of Life Cycle Assessment (LCA). **[5]**

b) Life cycle costing. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4228

[Total No. of Pages : 2

[5255] - 727
M.E. (Production) (CAD/CAM)
COMPUTER AIDED DESIGN
(2013 Pattern)

Time :3 hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4 and Q5 or Q6.***
2) ***Q7 and Q8 are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat self - explanatory sketches wherever necessary.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data if necessary.***

Q1) Discuss applications of computers for design. **[5]**

OR

Q2) Discuss Grover's model of Product life Cycle for Selection of CAD/CAM. **[5]**

Q3) Why parametric representation of geometrical entities are preferred in CAD software? Explain your answer with non-parametric and parametric equations of appropriate geometric entity. **[5]**

OR

Q4) What is Homogeneous Co-ordinate system? Explain the necessity of Homogeneous Co-ordinate system for transformation of geometric entities using suitable examples. **[5]**

Q5) What is blending of curves? Explain how two Bezier segments can be blended with suitable numeric example. **[7]**

OR

Q6) Explain the procedure of mass property calculations in CAD software. **[7]**

P.T.O.

Q7) a) What sweep representation scheme used for representation of a solid. **[8]**

b) What is Z - buffer algorithm for B-REP and CSG model? **[7]**

Q8) Write short notes on any three: **[18]**

a) Shading algorithms.

b) Virtual Realism

c) Parametric programming

d) Feature based segmentation.

Total No. of Questions : 6]

SEAT No. :

P4229

[Total No. of Pages : 2

[5255]-728

M.E. (Production) (CAD/CAM)

COMPUTER AIDED MANUFACTURING

(2013 Pattern)

Time : 2 Hours] *[Max. Marks :50*

Instruction to the candidates:

1) ***Answer Q1 or Q2, Q3, or Q.4, and Q5 & Q6 are compulsory.***
2) ***Assume suitable data if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain various features of CNC systems. **[5]**

b) Explain principle of rolling guide ways in CNC machines. **[5]**

OR

Q2) What do you mean by APT; Explain it with suitable example **[10]**

Q3) a) Explain CNC-Molding machine. **[5]**

b) Explain CNC-WEDM. **[5]**

OR

Q4) a) Explain various types of material handling systems. **[5]**

b) Explain various equipment's used in automatic material handling system. **[5]**

P.T.O

Q5) Write short note on : **[15]**

i) Automatic identification.

ii) Automated assembly system.

Q6) a) What is impact of automated factory on society? **[9]**

b) Explain factory data collection system. **[6]**

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Total No. of Questions : 6]

SEAT No. :

P4230

[Total No. of Pages : 2

[5255]-729

M.E. (Production) (CAD/CAM)

ADVANCED MATHEMATICS AND STATISTICS

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instruction 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 $6x^2+3y^2+3z^2-4xy+4xz-2yz$ to the canonical form by an orthogonal reduction and discuss its nature. Also find the modal matrix. **[8]**

b) Show that the transformation

$$y_1 = x_1 - x_2 + x_3$$
$$y_2 = 3x_1 - x_2 + 2x_3$$
$$y_3 = 2x_1 - 2x_2 + 3x_3$$

is regular, write down the inverse transformation. **[8]**

OR

Q2) a) Show that $A = \frac{1}{2}\begin{bmatrix} 1+i & -1+i \\ 1+i & 1-i \end{bmatrix}$ is a unitary 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]**

P.T.O

Q3) a) Solve by the method of Laplace transform the equation $y'' + 4y' + 3y = e^{-t}$ with $y(0) = y'(0) = 1$. **[9]**

b) Obtain fourier series for the function $f(x) = \begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(2-x), & 1 \le x \le 2 \end{cases}$ **[8]**

OR

Q4) a) Determine the solution of one-dimensional heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2} = 0$ boundary conditions are $u(0,t) = 0, u(l,t) = 0$ and initial condition $u(x,0) = x$. **[9]**

b) Solve the integral equation $\int_0^\infty f(x)\cos\lambda x \, dx = \begin{cases} 1-\lambda, & 0 \le \lambda \le 1 \\ 0, & \lambda > 1 \end{cases}$ **[8]**

Q5) a) A random variable X has the following Probability Distribution :

X :	0	1	2	3	4	5	6	7
P(X):	0	k	2k	2k	3k	k^2	$2k^2$	$k^2 + k$

i) Find k ii) Find $p(X < 6), p(X \ge 6), P(0 \le X < 5)$ **[9]**

b) For a chi-square distribution with n.d.f. establish the following recurrence relation between the moments.

$\mu_{r+1} = 2r(\mu_r + n\mu_{r-1}), r \ge 1$. Hence find β_1 & β_2. **[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 toller than soldier's. **[8]**

b) The ends A and B of a rod 20 cm long have the temperature at 30° C and 80° C until steady state prevails. The temperature of the ends are changed to 40°C and 60° C respectively. Find the temperature distribution in the rod at time 't'. **[9]**

Total No. of Questions : 6]

SEAT No. :

P4231

[Total No. of Pages : 2

[5255]-730

M.E. (Production) (CAD/CAM)

DESIGN OF EXPERIMENTS & RESEARCH METHODOLOGY

(2013 Pattern)

Time : 3 Hours] *[Max. Marks :50*

Instruction to the candidates:

1) ***Answer Q1 or Q2, Q3, or Q.4, and Q5 & Q6 are compulsory.***
2) ***Assume suitable data if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain steps and its significance of each for research methods. **[5]**

b) Explain Objective of research. **[5]**

OR

Q2) a) What are the different types of group problem solving techniques? Explain any one in short. **[5]**

b) Write short note on logical approach for problem solving. **[5]**

Q3) a) Explain use of analogy, data consideration and model testing. **[5]**

b) Explain various principles of modeling. **[5]**

OR

Q4) a) Explain Steps in Design of Experiments. **[5]**

b) Explain Methods of manipulating Variables. **[5]**

P.T.O

Q5) a) Explain the principles of factorial design. **[8]**

b) Write short note on robust design. **[7]**

Q6) Write short notes on: **[15]**

a) Bi-variate analysis.

b) Pre writing considerations of report.

c) Analysis of Co-variance.

Total No. of Questions : 8

SEAT No. :

P4232

[Total No. of Pages : 2

[5255]-731

M.E. (Production) (CAD/CAM)

COMPUTER INTEGRATED MANUFACTURING

(2013 Pattern)

Time : 3 Hours] *[Max. Marks :50*

Instruction to the candidates:

1) ***Attempt Q1 or Q2, Q3, or Q4, and Q5 or Q6***
2) ***Q7 or 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) What are the benefits of GT to the manufacturing industry? **[5]**

OR

Q2) What is a FMC? How does FMC ensure flexibility in manufacturing? **[5]**

Q3) What is a relational database? Describe the architecture of database management system. **[5]**

OR

Q4) What are the different levels of Integration against evolution of CIM? Explain. **[5]**

Q5) What are the components of PLM software? Explain. **[7]**

P.T.O

OR

Q6) Which are the typical sensors that are normally used in robot? Explain. **[7]**

Q7) a) What are the components of small local area network in CIM setup? Explain. **[8]**

b) What are the communication interfaces used in computer-to-computer communication? Explain in brief What are the commonly used interface cards? **[7]**

Q8) Write short notes on any three : **[18]**

a) ASRS

b) Data associated with FMC

c) ESPRIT – CIM OSA model

d) GKS implementation in a CAD workstation

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Total No. of Questions : 6

SEAT No. :

P4233

[Total No. of Pages : 2

[5255]-732

M.E. (Production) (CAD/CAM Engineering)

FINITE ELEMENT ANALYSIS

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks :50*

Instruction to the candidates:

1) ***Q5 & Q6 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 plain stress and strain with suitable examples. **[5]**

b) Enumerate the basic steps in finite element problems formulation? **[5]**

OR

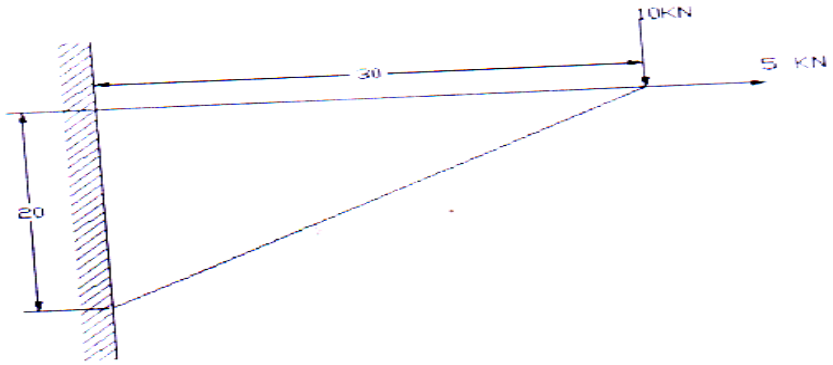
Q2) a) Explain the penalty approach to solve one dimensional FEM problems? **[5]**

b) Explain the properties of global stiffness matrix 'K'. What is banded or skyline matrix. **[5]**

Q3) a) Explain in brief different types of elements used in finite element formulation. **[4]**

b) A 2D plate loaded is shown in figure. Determine the displacements of nodes using the plane stress condition. Ignore body forces. Determine the reaction forces also stress in the elements. Assume thickness as 10 mm, E = 70 GPa & $\mu = 0.3$ **[6]**

P.T.O

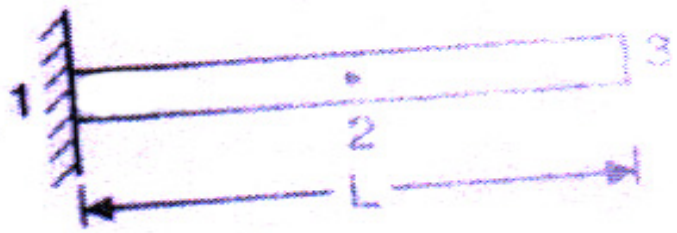


OR

Q4) a) What is meant by iso-parametric elements? Explain its types. **[4]**

b) Determine shape function in for CST element in terms of natural co-ordinate systems. **[6]**

Q5) For a uniform cross section bar of length L = 1m made of material having $E = 2 \times 10^{11}$ N/m^2 and $\rho = 7800$ kg/m^3, $A = 30 \times 10^{-6}$ m^2. Estimate the natural frequencies of axial vibration of the bar using both consistent and lumped mass matrices. Use two element mesh. **[15]**



Q6) a) Derive expression for load vector for frame element. **[8]**

b) Explain Hamilton's principle along with derivation for equilibrium. **[7]**

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Total No. of Questions : 8]

SEAT No. :

P4234

[Total No. of Pages : 2

[5255]-733

M.E. (Production-CAD/CAM)

OPTIMIZATION TECHNIQUES

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks :50*

Instruction 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) Find the dimensions of the box with largest volume if the total surface area is 64 cm^2. **[6]**

b) Formulate an optimization problem for minimum cost of a spring subjected to constraints on deflection to be less than 2 mm consider wire diameter, coil diameter, and number of turns as process variable.**[4]**

Q2) a) Use fibonacci search method to find value of x that minimizes

$f(x) = x^4 - 14x^3 + 60x^2 - 70x$ over the range [0,2]. Locate this value of x to within the range 0.3. **[6]**

b) Write algorithm for interval halving method **[4]**

Q3) a) Using pattern search method, *Minimize* $Z = 3x_1^2 + x_2^2 - 12x_1 - 8x_2$. Assume initial solution : [1,1] and increment be 0.5 (Perform only one iteration) **[6]**

b) Explain conjugate direction method for multivariable optimization. **[4]**

P.T.O

Q4) a) Minimize $(x_1-2)^4-(x_1-2)^2.x_2^2+(x_2+1)^2$ Such that

$-1 \le x_1 \le 5$ and $-6 \le x_2 \le 2$ using Newtons method. Perform first iteration only. Assume initial point as $X=\begin{Bmatrix}1\\1\end{Bmatrix}$. **[6]**

b) Explain applications of optimization techniques in production engineering. **[4]**

Q5) Minimize $f(x)=x^2 - 10x$ subject to g(x) = x-3 <=0 using exterior penalty method. **[10]**

Q6) Write short notes on : **[10]**

i) Real coded genetic algorithm

ii) Supervised and unsupervised learning in neural networks.

Q7) a) How the lean thinking can be combined with theory of constraints? What are its advantages? **[6]**

b) What are limitation of basic genetic algorithm? **[4]**

Q8) Draw flowchart of simulated annealing algorithm and explain its steps through suitable example. **[10]**

Total No. of Questions : 6]

SEAT No. :

P4235

[Total No. of Pages : 2

[5255]-734

M.E. (Production-CAD/CAM)

ADVANCED STRESS ANALYSIS

(2013 Pattern)

Time : 3 Hours] *[Max. Marks :50*

Instruction to the candidates:

1) ***Questions no 5 & 6 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 and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) Determine the principal direction and principal values of the second order cartesian tensor (stress tensor) T as given below. **[10]**

$$\left[\delta_{ij}\right] = \begin{bmatrix} 3 & -1 & 0 \\ -1 & 3 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

OR

Q2) Explain Mohr's circle for the 3D stresses and castigliano's theorem. **[10]**

Q3) How does the photoelastic strain gauge work? **[10]**

OR

Q4) A Semicircular surface crack in a pressure vessel is 20 mm deep. The crack is on the inner wall of the pressure vessel and is oriented such that the hoop stress is perpendicular to the crack plane. Calculate K_1 if the local hoop stress = 300 MPa and the internal pressure = 30 MPa. Assume that the wall thickness >> 20mm. **[10]**

P.T.O

Q5) a) Consider an unnotched specimen with an endurance limit of 250 MPa. If the Specimen was notched such that $Kf = 1.6$, What would be the factor of safety against failure for $N > 10^6$ cycles at a reversing stress of 125 MPa. **[10]**

i) Solve by reducing S'e.

ii) Solve by increasing the applied stress

b) Write note on fatigue crack initiation and propagation in ductile metals.**[5]**

Q6) a) Determine Complex formulation of the plane elasticity problem. **[10]**

b) Explain the mechanism of conformal mapping. **[5]**

Total No. of Questions : 8

SEAT No. :

P4236

[Total No. of Pages : 2

[5255]-735

M.E. (Produciton Engineering) (CAD/CAM)

COMPUTER AIDED PRODUCTION PLANNING

(2013 Pattern)

Time : 2 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3, or Q4, and Q5 or Q6***
2) ***Q7 or 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 ALDEP use in facility planning. **[5]**

OR

Q2) Discuss different measures of forecast errors. **[5]**

Q3) Discuss GT benefits and limitations. **[5]**

OR

Q4) Discuss use of quadratic assignment model adding new machines to existing facility. **[5]**

Q5) Discuss ERP implementation issues. **[7]**

P.T.O

OR

Q6) Discuss evaluation of heuristics in view of Production scheduling. **[7]**

Q7) a) Four jobs are to be processed using three machines. The time required on machine 'j' for job 'i' is given in the table below: **[8]**

Job	Time required on		
i	Machine A	Machine B	Machine C
1	5	8	20
2	6	30	6
3	30	4	5
4	2	5	3

How should the jobs be scheduled so as to minimize the total time required to complete all the jobs?

b) The weekly demand for the product has the following distribution : **[7]**

Demand	1000	1100	1200	1300	1400	1500
Probability	0.03	0.17	0.27	0.28	0.18	0.07

Simulate for 10 weeks and find expected demand. (Use random numbers from calculator)

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

a) Random number generation

b) CDS algorithm for sequencing

c) Software for ERP

d) Gantt chart

e) MRP II

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Total No. of Questions : 8]

SEAT No. :

P4237

[Total No. of Pages : 3

[5255]-736

M.E. (Production-Manufacturing and Automation)

MATHEMATICS AND STATISTICS

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instruction to the candidates:

1) ***Answer any 5 questions out of 8 Questions.***
2) ***Neat diagrams should be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***All questions carry equal marks.***
5) ***Use of logarithmic tables slide rule, mollier-charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data if necessary.***

Q1) a) If $f(z) = u + iv$ be analytic function of $z = x + iy$ and

$u - v = (x - y)(x^2 + 4xy + y^2)$ find $f(z)$ as a function of z **[5]**

b) Evaluate, $\oint_C \frac{3z^2 + z}{z^2 - 1} dz$ where C is the circle $|z - 1| = 1$ **[5]**

Q2) a) A mass suspended at the end of the light spring having spring constant k, is set into vertical motion. Use Lagrange's equation to find the equation of motion of the mass. **[5]**

b) Prove that the shortest distance between two points in a plane is straight line. **[3]**

c) State the necessary condition for the functional **[2]**

$\int_{x_1}^{x_2} f(x, y, y', y'')\, dx$ to be extremum.

P.T.O

Q3) a) Solve the partial differential equation

$\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square with sides x = 0 = y, x = 3 = y with u = 0 on the boundary and the mesh legth = 1 **[5]**

b) State the Lagrange's equation in the generalized co-ordinates. **[2]**

c) Explain the standard 5-point formula to solve the Laplace equation **[3]**

Q4) a) If $p_n(x)$ is a legendre polynomial of first kind prove that

$(2n + 1)\, p_n(x) = p'_{n+1}(x) - p'_{n-1}(x)$. **[4]**

b) By using series expression for $J_n(x)$ derive $\frac{d}{dx}[x^n J_n(x)] = x^n J_{n-1}(x)$. **[4]**

c) State Rodrigue's formula and prove that **[2]**

$$p_2(x) = \frac{1}{2}(3x^2 - 1)$$

Q5) a) The following table gives the number of accidents that took place in an industry during various days of the week.

Day	Mon	Tues	Wed	Thurs	Fri	Sat
No. of Accidents	14	18	12	11	15	14

Test if the accidents are uniformly distributed over the week

Given χ^2 at 5% level for 5 degrees of freedom, is 11.09 **[5]**

b) A random sample of size 25from a normal population has the mean 47.5 with Standard deviations 8.4.Does this information refuses the claim that the mean of population is 42.1 . Given ($t_{25,0.05} = 2.06$). **[5]**

Q6) a) Show that the map of the real axis of the w-plane, by the transformation

$w = \frac{1}{z + i}$, is a circle and find it's radius and centre. **[4]**

b) A die is tossed thrice. A success is 'getting 1 or 6' on a toss. Find the mean and Standard deviation of the number of successes. **[4]**

c) Define a stochastic process **[2]**

Q7) a) Fit a Poisson distribution to the set of observations : **[5]**

x :	0	1	2	3	4
f :	46	38	22	9	1

b) Prove that the following function

$u = 2x - x^3 + 3xy^2$ is harmonic.

Also find the conjugate function v and corresponding analytic function u+iv. **[5]**

Q8) a) If the probability of a bad reaction from a certain injection is 0.001, determine. The chance that out of 2,000 individuals more than two will get a bad reaction. **[5]**

b) Find the mean recurrence time for each state of the following Markov chain **[5]**

$$P = \begin{bmatrix} 0.33 & 0.33 & 0.34 \\ 0.25 & 0.25 & 0.50 \\ 0.20 & 0.60 & 0.20 \end{bmatrix}$$

ⓘⓘⓘ

Total No. of Questions : 8]

SEAT No. :

P4238

[Total No. of Pages : 2

[5255]-737

M.E. (Production-Manufacturing & Automation)

INDUSTRIAL AUTOMATION

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instruction to the candidates:

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

Q1) a) A pump has a displacement of 15 cm^3/rev is driven at 1000 rpm and 100 bars. The volumetric efficiency is 0.90 and overall efficiency is 0.80. Calculate **[6]**

i. Pump delivery in litres per minute.

ii. The input power at the pump shaft in KW.

iii. The drive torque at the pump shaft

b) Explain and justify the advantages of meter out circuit over meter in circuit with respect to system efficiency, feed rate variation with load, and cylinder overrunning. **[4]**

Q2) a) Design and draw pneumatic circuit for a power door opening system for which the operators need to activate the door cycle from both inside and outside by pushing a button. The door needs to remain open for an adjustable time period before it automatically closes. The operators must also have a means to keep the door open continuously when needed.**[6]**

b) Sketch and explain with suitable example the use of twin pressure valve.**[4]**

P.T.O

Q3) a) Explain with suitable example various status flag used in microprocessor. **[4]**

b) Compare characteristics of P, P1 and PID controllers with respect to rise time, settling time, steady state error and percent overshoot. **[6]**

Q4) Write short notes on :

a) Tactile sensors **[5]**

b) Servo valves **[5]**

Q5) a) Explain various types of automated workpiece handling system. **[6]**

b) Explain laser target navigation system of AGV. **[4]**

Q6) a) What are requirements of foundry robot **[6]**

b) One axis of a RPL robot is a linear slide with a total range of 1200 mm. The robot control memory has 8 bit capacity. It is assumed that the mechanical errors associated with the arm are normally distributed with a mean at a given taught point and an isotropic standard deviation of 0.05 mm. Determine: **[4]**

i) The control resolution for the axis

ii) The spatial resolution of axis

iii) The defined accuracy

iv) The repeatability

Q7) a) What is system modeling? How a mathematical model can be built for a manufacturing plant. **[6]**

b) Explain role of artificial techniques in manufacturing systems. **[4]**

Q8) Write short notes on:

a) Collision free motion planning in AGV **[5]**

b) Artificial neural networks **[5]**

Total No. of Questions : 8]

SEAT No. :

P4239

[Total No. of Pages : 2

[5255]-738

M.E. (Production Engg.) (Manufacturing & Automation)

ADVANCED MANUFACTURING PROCESSES

(2013 Pattern)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of electronic pocket calculator and logarithmic tables is allowed.***

Q.1) a) Which are the important steps followed in the modern foundries during sand casting? **[4]**

b) How simulations of mold filling help to improve performance casting process? **[4]**

c) Which features of non-conventional machining processes attract to use them? **[2]**

Q.2) a) Describe important characteristics of heat affected zone in EDM. **[4]**

b) Explain various welding defects with their causes and remedies. **[4]**

c) Which thermal defects in casting must be reduced? **[2]**

Q.3) a) On which principle of Electro Chemical machining (ECM) work. **[4]**

b) Explain with neat sketch working principle of Electro discharge machining **[4]**

c) Is there any difference between destructive and Non-destructive testing of castings? **[2]**

P.T.O

Q.4) a) Which are the advantages and limitations of Electro discharge Machining **[5]**

b) Explain various arc welding defects with their causes and remedies **[5]**

Q5) a) A rod of 10 mm diameter is to be reduced to wire of 3mm 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 high speed hot forging with neat sketch **[4]**

c) Write two names of non-conventional forming processes **[2]**

Q.6) a) Explain metal stretch forming with neat sketch. **[4]**

b) What you mean by electromagnetic forming. **[4]**

c) Differentiate between hot forming and cold forming. **[2]**

Q.7) a) Explain important process parameters of explosive forming process **[4]**

b) A tube of 32 mm external diameter and 2 mm thickness is to be reduced to 30 mm external diameter and 1 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 the fixed plug. **[4]**

c) What is high speed blanking? **[2]**

Q.8) a) Which are the various strategies to reduce roll force? **[5]**

b) What is the use of forming limit diagram? **[5]**

Total No. of Questions : 8]

SEAT No. :

P4240

[Total No. of Pages : 3

[5255]-739

M.E. (Production Engg.) (Manufacturing & Automation)

RESEARCH METHODOLOGIES

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q.1) a) Explain applied verses fundamental research. **[4]**

b) What are criteria of a good research? **[4]**

c) What are objectives of research? **[2]**

Q.2) a) Compare the exploratory and descriptive research designs with respect to sampling design, statistical design, observational design, and operational design. **[4]**

b) The effect of four factors A, B, C, and D (three level each) on response R (three trial runs for each experiment) for 9 experiments is shown in Table. Determine the factor having maximum effect on the response R.**[6]**

Experiment Number	A	B	C	D	R		
					Trial 1	Trial 2	Trial 3
1	1	1	1	1	78	74	72
2	1	2	2	2	54	60	55
3	1	3	3	3	39	46	39
4	2	1	2	3	80	82	88
5	2	2	3	1	64	70	69
6	2	3	1	2	36	44	45
7	3	1	3	2	74	65	67
8	3	2	2	3	64	79	75
9	3	3	1	1	45	49	45

P.T.O

Q.3) a) What do you mean by reliability, suitability, adequacy and accuracy of data? Explain with suitable example. **[4]**

b) Differentiate between collection of the data through questioners and schedules. **[4]**

c) Explain 'Thematic appreciation test'. **[2]**

Q.4) Write short notes on : **[10]**

i) Basic principles of experimental designs.

ii) Scaling techniques

Q5) a) Certain manufacturing company wants to manufacture 5 products based on their customer demand. Product demands for previous year were 20% for product 1,30% for product 2, 15% for product 3, 25% for product 4, and 10% for product 5. The survey of current year conducted for 500 customer shows that 130 customers preferred product 1, 100 customers preferred product 2, 80 customers preferred product 3, 140 customers preferred product 4, and 35 customers preferred product 5. Calculate Chi square (χ^2) value. **[4]**

b) Temperatures are measured at various points on a heated plate. Estimate the temperature at x = 4.8 and y = 3.2. **[6]**

	$x = 0$	$x = 4$	$x = 8$
y = 0	100.00	80.00	60.00
y = 4	75.00	38.43	40.00
y = 8	40.00	30.00	20.00

Q.6) a) Determine the most suitable process plan for a certain process using Graph theory and matrix approach. Performance of Process plans is measured based on three attributes namely: Processing time (PT), tooling cost (PC), and work in process inventory (WIP). The attribute data for four process plans is presented in Table below. **[6]**

Process Plans	Process plan selection attributes		
	PT (min)	PC (Rs)	WIP
1	187	420	104
2	95	591	70
3	170	1,365	189
4	75.5	1,120	210

The relative importance matrix is as follows

$$\begin{array}{c} \\ PT \\ PC \\ WIP \end{array} \begin{array}{c} \begin{array}{ccc} PT & PC & WIP \end{array} \\ \begin{bmatrix} 1 & 0.55 & 0.40 \\ 1.818 & 1 & 0.80 \\ 2.5 & 1.25 & 1 \end{bmatrix} \end{array}$$

b) What are specific advantages of Data envelopment analysis method over other multi-criteria decision making techniques? **[4]**

Q.7) a) Explain steps in writing a research report. **[4]**

b) What are techniques of interpretation of research analysis? **[4]**

c) What is purpose of footnotes? **[2]**

Q.8) Write short notes on : **[10]**

a) Roulette wheel selection in genetic algorithm

b) Algorithm for TOPSIS method

Total No. of Questions : 8]

SEAT No. :

P4241

[Total No. of Pages : 3

[5255]-740

M.E. (Production - Manufacturing and Automation) (Semester - II)

COMPUTER INTEGRATED MANUFACTURING

(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 Calculator is allowed.***
5) ***Assume Suitable data jf necessary.***

Q1) a) Given B_0 (l,2). B_1 (3,3). B_2(5,7), B_3(8,3) the vertices ofaBezier polygon, determine points on the curve with parameter t = 0.4. **[6]**

b) A line segment having end points (3.2.0) and (7,4, 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' = 0.35 and rotation angle of 50º. **[4]**

Q2) a) Enlist and explain various motion statements in APT. **[4]**

b) How the cutter compensation is given in case of machining centre? Explain with the help of example how it is operational. Specify any limitation in using this facility. **[6]**

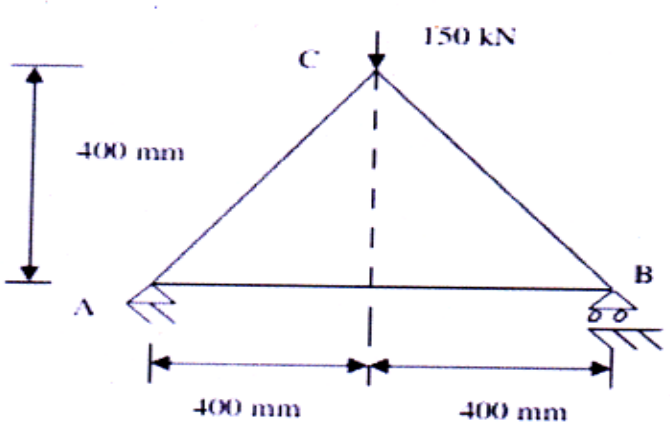
Q3) a) Explain the features of Hermitian interpolation function with an example.**[4]**

b) For a certain application, the governing equation is given as: **[6]**

$-\frac{d^2u}{dx^2}u + x^2 = 0$ for $0 < x < 1$. $u(0) = 0$, u(1) = 0. Obtain the solution considering uniform mesh of two linear elements.

P.T.O

Q4) a) For a 3 bar truss shown in Fig. determine the nodal displacements, support reaction and stress in each member. Take modulus of elasticity as 200 GPa, areas of cross section for element 1.2 and 3 is 1500 mm^2, 2000 mm^2, and 2000 mm^2 respectively. **[10]**



Q5) a) What is product data management? What are its benefits? **[5]**

b) What are database requirements of computer integrated manufacturing? **[5]**

Q6) a) Explain RFID method of automated factory data collection. **[4]**

b) What is ERP? What are the business functions those can be automated using ERP? **[6]**

Q7) a) A group technology cell has three machines and is used to process the family of four parts. The Table below lists production quantities (Q), production time (T) and machine fraction for each family member (f). Assume non- operation times are all same at 30 mm. per machine. **[4]**

	Machine 1		Machine 2			Machine 3	
Part	Q	T	f	T	F	T	F
1	1	3.0	0.2	4.5	0.3	2.25	0.15
2	1	2.0	0.2	4.0	0.4	3.0	0.3
3	1	5.0	0.25	4.0	0.2	3.0	0.15
4	1	4.0	0.3	1.333	0.1	2.667	0.2

Determine:

b) Average hourly production rate for the cell **[2]**

c) Utilization of each machine and average utilization of cell **[2]**

d) Manufacturing lead time **[2]**

Q8) Write short notes on: **[10]**

a) Elements of FMS

b) Computer aided quality control

Total No. of Questions : 8]

SEAT No. :

P4242

[Total No. of Pages : 3

[5255]-741

M.E. (Production) (Manufacturing & Automation) (Semester - II)

TOOL AND DIE 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 full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data jf necessary.***

Q1) a) For machining medium carbon steel, the conditions are: **[6]**

- Cost of operating machine = Rs 0.3 per min
- Total cost of tool change = Rs 8.
- The cutting speed =40 m/min.
- Tool life = 50 min
- Exponent index n = 0.2

Find optimum tool life and cutting speed at optimum tool life.

b) 15 gm of the steel chips with total length of 540 mm are obtained In an orthogonal cutting process with rake angle 5°, width of the cut 8 mm and undeformed chip thickness of 0.25 mm. What is slip plane angle? Consider density of work material as 7800 kg/m^3. **[4]**

Q2) a) Explain analysis to determine the width of diamond pin. **[6]**

b) Explain with neat sketch any two types of quick acting clamps. **[4]**

P.T.O

Q3) a) A washer with a 12.7mm hole and an outside diameter of 25.4 mm is to be made from 1.50 mm thickness strip of 0.2% carbon steel. The ultimate shearing Strength of the material is 2800 Kg/cm^2 **[6]**

i) Find the total cutting force if both punches act at the same time and no shear is applied to either punch or die.

ii) What will be the cutting force if the punches are staggered? So that only one punch acts at a time.

iii) Taking 60% penetration and shear on punch of 1.0mm. What will be the cutting force if both punches act together?

b) Explain design procedure of deep drawing die. **[4]**

Q4) a) Write note on: Fixture configuration for deterministic position. **[5]**

b) The strip thickness is 2.0 mm and the length of blank is 10mm and height is 20mm. Strip length is 1.0m. Find **[5]**

i) the value for front scrap

ii) the value for scrap bridge

iii) width and length of stock needed to produce one part.

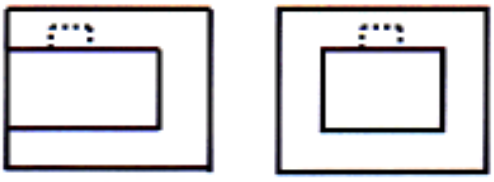
iv) Number of parts which can be produced in strip.

v) Scrap maintaining at the end of strip.

Q5) a) Discuss steps for stock size calculation for impression die forging. **[6]**

b) Explain basic rules of preform design in forging steel parts. **[4]**

Q6) a) Draw the configuration of an injection mold for producing PVC box having internal undercut as shown in figure. **[6]**



b) Explain with neat sketch pressure time diagram for injection molding process. **[4]**

Q7) For Al alloy die casting following data is used:

- Component volume = 120000 mm^3
- Average wall thickness of die casting = 2.5 mm
- Temperature of molten metal = 640°C
- Minimum flow temperature = 570°C
- Die cavity surface temperature = 180°C
- % solid fraction allowed = 25%
- Conversion factor (to convert % solid factor to temperature unit) = 3.8°C/%
- Gate velocity = 46.5 m/s
- Gate thickness = 2.5 mm
- Constant (k) = 0.0346

i) Calculate cavity fill time **[2]**

ii) Calculate filling rate **[2]**

iii) CaLculate area of gate **[2]**

iv) Calculate gating length **[2]**

v) Calculate runner width and depth **[2]**

Q8) a) Write note on: Design of ejection system for injection mold. **[5]**

b) Write note on: Design of blocking impression in forging die design. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4243

[Total No. of Pages : 2

[5255]-742

M.E. Production (Manufacturing and Automation) (Semester - II)

ADVANCED JOINING PROCESSES (Credit System)

(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 whenever necessary.***
4) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain friction welding with suitable sketch. State its process variables also. **[4]**

b) Give a brief review of conventional welding processes employed in industries. **[4]**

c) Why fluxes are utilized in welding? **[2]**

Q2) a) Describe the working principle of Plasma arc welding with a neat sketch. **[4]**

b) Discuss on electron beam welding equipment with comparison of the vacuum and atmospheric welding systems utilized in it. **[4]**

c) Enumerate specific applications of ultrasonic welding. **[2]**

Q3) a) Explain the volt-ampere (V-I) characteristics and volt-arc (V-L) characteristics associated with welding arc. **[4]**

b) Briefly discuss the necessity of conducting destructive testing of welds. Why standard specimens are used for testing? What are the basic considerations for choosing a test of mechanical properties? **[4]**

c) State various weld defects with suitable scratches occurring in butt and fillet welds. **[2]**

P.T.O

Q4) a) What are the different the types welding distortions? How the distortions can be controlled in welded plates? **[5]**

b) Explain the stovepipe technique for pipe welding with a neat sketch. **[5]**

Q5) a) Calculate the melting efficiency in the case of arc welding of steel with a current of 180 A at 20 V. The travel speed is 7 mm/s, and the cross sectional area of the joint is 20 mm^2. Heat required to melt steel may be taken as 15 J/mm^3 and heat transfer efficiency is 0.85. **[4]**

b) State the reasons for occurrence of residual stress in welds. Explain the stress relieving treatment of welds. **[4]**

c) What makes spray metal transfer superior to globular metal transfer? **[2]**

Q6) a) Briefly discuss thermal and mechanical treatment of welds. What common thermal treatments are carried out on welds? **[4]**

b) Discuss in brief Time Temperature Transformation during the welding of steels. **[4]**

c) What do you understand by heat affected zone (HAZ) in welding? **[2]**

Q7) a) Write briefly on hot gas welding technique utilized for welding of PVC plastics. **[4]**

b) Describe ultrasonic welding technique for welding plastics with suitable sketch. **[4]**

c) Draw a neat sketch of test specimen with a butt joint in order to find out strength of plastic sheets. **[2]**

Q8) a) Why cast irons are difficult to weld than steels? **[5]**

b) Discuss on different stages of short-circuiting transfer in metal inert gas welding **[5]**

Total No. of Questions : 8]

SEAT No. :

P4244

[Total No. of Pages : 2

[5255]-743

M.E. Production (Manufacturing & Automation)

ADVANCED ROBOTICS

(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 Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Explain four basic robot configurations. **[4]**

b) What is the role of robot in inspection? **[4]**

c) State laws of robotics. **[2]**

Q2) a) What are various geometric parameters related to link of robot arm? Explain. **[4]**

b) Explain workplace design consideration for safety in robot operations. **[4]**

c) What is inverse kinematics problem? **[2]**

Q3) a) Explain vacuum gripper in robot. **[4]**

b) How is force analysis done to grip the component using friction? **[4]**

c) Explain briefly adhesive gripper. **[2]**

Q4) a) Write a short note on adaptive control in robot. **[5]**

b) Explain PID controller. **[5]**

P.T.O

Q5) a) Explain the feature of second generation language. **[4]**

b) Explain lead through programming in detail. **[4]**

c) Explain WAIT & SIGNAL command. **[2]**

Q6) a) Write a short note on proximity & range sensors. **[4]**

b) How is image acquisition done in a vision system? **[4]**

c) What is machine vision? **[2]**

Q7) a) Explain D-H parameter in details. **[5]**

b) Determine Jacobian and joint velocities for 3DOF planar arm with revolute joint. **[5]**

Q8) a) How is segmentation done using edge detection? **[5]**

b) How is image processing done in a vision system? **[5]**

Total No. of Questions : 8]

SEAT No. :

P4245

[Total No. of Pages : 2

[5255]-744

M.E. Production Engineering

SURFACE ENGINEERING

(Manufacturing & Automation)

(2013 Pattern)

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 pocklet calculator and logarithmic tables is allowed.***

Q1) a) How degradation of metal surface of industrial part take place? **[4]**

b) Which are the surface dependent engineering properties of metals? **[4]**

c) List out the types of metal corrosion. **[2]**

Q2) a) How are industrial parts cleaned mechanically before coating? **[4]**

b) Which factors to be considered for industrial parts cleaning? **[4]**

c) Differentiate between diffusion and ion implantation. **[2]**

Q3) a) Write short notes on:

i) Metal cladding **[4]**

ii) Nitriding **[4]**

b) List out any four surface hardening techniques of industrial parts. **[2]**

Q4) a) Which are the factors responsible for corrosion? Describe. **[5]**

b) How is fatigue life of industrial part measured? **[5]**

P.T.O

Q5) a) Which are the surface engineering problems related to substrate characteristic? **[4]**

b) Explain with sketch Sol-Gel Process. **[6]**

Q6) a) Describe four non-destructive methods of measuring coating thickness. **[8]**

b) Suggest suitable coating hardness testing method for following: **[2]**

i) Hard rubber & Plastics

ii) Steel, Cu, Al, Zn & Mg

Q7) a) Write note on: 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 : 6]

SEAT No. :

P4248

[Total No. of Pages : 2

[5255]-747

M.E. (Petroleum Engineering) (End-Semester)

ADVANCED DRILLING ENGINEERING

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any Five.***
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 is kick tolerance? Explain importance in casing seat / shoe depth selection. **[5]**

b) Discuss surface casing design loads in detail. **[3]**

c) Explain tri axial stress analysis in brief. **[2]**

Q2) a) What is GTO? Explain in detail. **[5]**

b) Discuss offshore conductor design guidelines in detail. **[5]**

Q3) a) Discuss importance of torque drag in planning of directional well. **[5]**

b) Find measure depth for L type directional well. **[5]**

Slot coordinate 15.32 ft N, 5.06 ft E

Target coordinate 1650 ft N, 4510 ft E

TVD Target = 9,880 ft,

KOP = 1,650 ft,

Build up rate 1.5° per 100 ft.

P.T.O

Q4) a) Discuss functions of oil well cement, API classification of oil well cement in detail. **[5]**

b) Write note on squeeze cementation in detail. **[5]**

Q5) a) Discuss drill string design considerations in detail. **[4]**

b) Discuss different types of Multilateral wells in and design criteria in detail. **[6]**

Q6) a) Draw circulation system on rig and explain functions of mud cleaning equipment in detail. **[6]**

b) What are different types of drilling fluids? Discuss functions of drilling fluid in brief. **[4]**

Total No. of Questions : 8]

SEAT No. :

P4249

[Total No. of Pages : 2

[5255]-748

M.E. (Petroleum Engineering) (Semester - I)

RESEARCH METHODOLOGY

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Any Five questions.***
2) ***Figures to the right side indicate full marks.***
3) ***Illustrate your answers with suitable examples and diagrams, wherever necessary.***
4) ***Write relevant question number before writing the answer.***

Q1) a) "What is Research Methodology? Explain the steps in scientific research process. **[4]**

b) What is hypothesis? Explain in brief different types of hypothesis. **[3]**

c) Explain the steps in process of engineering research work. **[3]**

Q2) a) Define the meaning research problem? Explain the components of research problem. **[4]**

b) Examine the different types of observations and their uses in engineering research. Discuss the ethical issues involved in making use of the various Observational techniques. **[4]**

c) Differentiate between applied research and basic research. **[2]**

Q3) a) What do you mean by 'Sample Design'? What points should be taken into consideration by a researcher in sample design for any research project? **[4]**

b) Enumerate the different methods of collecting data giving one example each. **[4]**

c) Critically examine the qualitative and quantitative research methods. **[2]**

P.T.O

Q4) a) Explain how sampling and statistical inference are useful for any research work. **[4]**

b) What is analysis of variance? Give an example to illustrate the same. **[2]**

c) What is Chi-Square test? Explain the significance in statistical analysis of any research problem. **[4]**

Q5) a) Write a comprehensive note on the " Task of defining a research problem". **[4]**

b) What do you mean by 'Sample Design'? What points should be taken into consideration by a researcher in sample design for any research project? **[4]**

c) Write a brief note on: Citation Method **[2]**

Q6) a) What are the different components of a research report? Explain with suitable example. **[4]**

b) State and explain different steps in data processing. **[4]**

c) Write a brief note on: Data Collection by Survey Method. **[2]**

Q7) a) Discuss about measures of central tendency and how they are useful in any research work. **[5]**

b) What is factor analysis? Explain with an example. **[5]**

Q8) a) Write notes on : (Any Two) **[5]**

i) Technology Transfer

ii) Ethics in Research

iii) Threats and Challenges to Good Research

b) Discuss the different tools and techniques of data collection and analysis used in research. Support your answer by giving suitable example. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4250

[Total No. of Pages : 2

[5255]-749

M.E. (Petroleum Engineering) (Semester - II)

ADVANCED RESERVOIR ENGINEERING

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Derive the diffusivity equation in Cartesian coordinates. **[5]**

b) How would you compute the GOC and OWC using capillary pressure curves? Explain in detail. **[3]**

c) What do you mean by relative permeability to a particular fluid? How is it different from the permeability which is used in Darcy law? **[2]**

Q2) a) What do you mean by the continuity equation? What are the assumptions that are used to derive the same? **[5]**

b) What do you mean by discretization? Why do you discretize? What are the advantages and disadvantages of discretization? **[3]**

c) What are the assumptions used for deriving the diffusivity equation? **[2]**

Q3) a) Draw the graph of viscosity, formation volume factor of oil, water and gas with respect to pressure. Explain the trends and give reasons for the particular trends observed in the graphs. **[5]**

b) Write a detailed note on microbial enhanced oil recovery **[3]**

c) What do you mean by polymer flooding? How is it different from surfactant flooding and what are the advantages? **[2]**

P.T.O

Q4) a) What are the five different types of fluids? Explain with the help of a phase diagram. **[5]**

b) Explain in detail 5 fluid properties for oil, and how they vary with pressure? **[3]**

c) What do you mean by retrograde condensate reservoirs? Explain in with the help of a diagram **[2]**

Q5) a) Draw the relative permeability curves for a oil-wet rock and a water-wet rock. Explain how they are different from each other? **[5]**

b) What do you mean by in-situ combustion? Explain the concept with its advantages, disadvantages, and screening criteria. Also, draw appropriate sketches to explain the concept. **[3]**

c) What are the screening criteria for implementing a particular EOR method? Write in detail. **[2]**

Q6) a) In EOR, what do you mean by efficiency? What is the difference between areal and vertical sweep efficiency? **[4]**

b) Explain SAGD and Huff-and-puff method in detail, with appropriate diagrams. In which category does this EOR method included? **[4]**

c) Write a short note on WAG. **[2]**

Q7) Write short notes on:

a) ASP Flooding - Its advantages, disadvantages and applications. **[5]**

b) Thermal EOR, with its screening criteria. **[5]**

Q8) Explain in detail, what do you mean by:

a) Fractional flow theory **[5]**

b) Miscible and immiscible displacement **[5]**

Total No. of Questions : 8]

SEAT No. :

P4251

[Total No. of Pages : 2

[5255]-750

M.E. (Petroleum Engineering) (Semester - II)

ENVIRONMENTAL TECHNOLOGY IN PETROLEUM ENGINEERING

(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) ***Illustrate your answers with suitable examples and diagrams, wherever necessary.***
4) ***Write relevant question number before writing the answer.***

Q1) a) Explain Chemical and Biological methods of oil spill control in marine environment. **[4]**

b) Explain sources of hydrocarbon release into sea. **[3]**

c) Write a brief note on : NORM in shale **[3]**

Q2) a) Explain about offshore and onshore waste management options in oil industry **[4]**

b) What are environmental air quality monitoring parameters? **[3]**

c) Explain in brief chemical methods to prevent oil spills. **[3]**

Q3) a) What is CO_2 sequestration? Describe the role of petroleum industry in CO_2 sequestration. **[4]**

b) Explain sources of hydrocarbon release into sea. **[3]**

c) Write a note on "Accidents in oil industry and environmental degradation. **[3]**

P.T.O

Q4) a) Explain the different causes and preventive measures for fire and explosion hazards in petroleum industry **[4]**

b) Write a brief note on : Toxicity of petroleum products and treatment chemicals **[3]**

c) Discuss about potential impacts of oil industry on the environment. **[3]**

Q5) Write notes on: **[10]**

a) Disaster Management

b) CDM and Kyoto protocol

Q6) a) Describe various types of audits involved in environment management of oil industry. How do they incorporate legal, ethical, social, and political issues? **[4]**

b) Explain the principles of HAZOP. **[3]**

c) Write a note on "Risk Analysis and Management" **[3]**

Q7) a) What is meant by mud dispersibility? Explain how selection of mud based on environmental friendly decisions combat borehole stability problems? **[5]**

b) Discuss Environmental Regulations in Oil Industries. **[5]**

Q8) Write notes on : **[10]**

a) Health and Safety Laws

b) Action Taken Report

Total No. of Questions : 8]

SEAT No. :

P4252

[Total No. of Pages : 3

[5255]-751

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

ADVANCED PRODUCTION ENGINEERING

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Explain minimum conditions for an emulsion to exist and also explain basic principle of various emulsion treating methods that are used in oil field. **[5]**

b) Draw and demonstrate the productive ability of various artificial lifting techniques in a sequence on a typical IPR plot. Indicate position of all ALTs on it. **[3]**

c) Indicate and explain the necessity of artificial lifting on a typical IPR-VLP plot **[2]**

Q2) a) Draw process flow diagrams for different processes such as stage separation, gas compression system, water treating system etc; or single process flow diagram for entire GGS. **[5]**

b) Which method of gas lifting you will recommend for high bhp, high P. I. wells? Explain it with neat schematic sketch. **[3]**

c) Draw neat schematic sketch of any one kind of heater treater. **[2]**

P.T.O

Q3) a) Write and explain inflow and outflow equations for any four nodes of a petroleum production system. **[4]**

b) Draw neat schematic sketch of a three phase vertical separator and write its advantages. **[4]**

c) Explain: **[2]**

i) Liquid fall back

ii) Retention time

Q4) a) Draw necessary graph and investigate to decide the sizing of a horizontal treater for a treating temperature of 120 ^{0}F, 140^{0}F and 160^{0}F. Value of tested oil viscosity is 11, 8 and 5 cp respectively at these temperature readings. Diameter of water droplet to be settled from oil at these temperature readings is given as 400, 300 and 200 microns respectively.

Other data: Oil gravity 35^0 API. Oil flow rate 6000 bbl/day. Inlet oil temperature 88^0 F. Water sp. Gravity 1.03. Retention time required is 18 minutes. Inlet BS&W=8 %. Outlet BS & W = 2% **[5]**

b) Discuss and draw principle mechanisms and their features effective in separation of oil, gas and water inside a separator. **[3]**

c) In which kind of well parameters or field production conditions you will recommend use of a three phase horizontal separator? Write. **[2]**

Q5) a) Write usability of continuous gas lift only in terms of excellent/good/fair/poor in a tabular form for following well conditions. High PI, low GOR, adaptability to deviated wells, capability to produce sand, low volume lift capability and ability to handle paraffinic crude oil. **[5]**

b) Write the working principle and applications of plunger assisted intermittent gas lifting mechanism. **[3]**

c) Write actions or role of a demulsifier to promote separation of oil and water. **[2]**

Q6) a) Draw necessary diagram and explain in detail, working of a typical subsea production system. **[4]**

b) Write and discuss the objectives of optimization in stage separation process. **[3]**

c) Discuss the working mechanism of PCP system. **[3]**

Q7) a) Calculate, flowing bottom hole pressure required in following cases separately if ALT is to be installed. Neglect flowing frictional resistance. Well depth = 6500 ft. Wellhead pressure, Pwh value is given for each. **[5]**

i) Well is standing full of water, sp. gravity = l.06. Pwh = 300 psi

ii) Well is standing full of 40° API. Pwh = 200 psi.

b) Draw and explain in brief, 'dynamometer card', Surface or down hole dynamometer cards for various lift conditions, representing performance of SRP system. **[5]**

Q8) a) Classify gas lift valves. Draw typical diagram and discuss working mechanism of any one gas lift valve in brief. **[5]**

b) For a petroleum production facility, design a two phase horizontal separator using the following data: **[5]**

Gas flow rate (Qg) = 10 MMscf/day. Oil flow rate (Qo) = 1900 bbls/day.

Oil gravity= 36° API. Operating pressure = 900 psia. Operating temperature = 60 °F. Specific gravity of gas = 0.6. Gas compressibility = Z = 0.83. It is given that drag coefficient, Cd = 0.72 (Constant based on liquid, gas properties and for gas capacity constraint). Size of liquid droplet to be separated = dm = 140 micron.

Slenderness ratio should be between 3 & 4. Consider retention time as 5 and 6 minutes.

Total No. of Questions : 8]

SEAT No. :

P4253

[Total No. of Pages : 2

[5255]-752

M.E. (Petroleum Engineering)

ADVANCED WELL TESTING

(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 side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) State the laws which are used for deriving the diffusivity equation, and explain each one of them in detail. **[5]**

b) What is meant by ETR, MTR and LTR? Explain in detail. **[3]**

c) What is the relevance of transient, pseudo steady state and steady state flow regime in well testing? **[2]**

Q2) a) What do you mean by the continuity equation? What are the assumptions that are used to derive the same? **[5]**

b) Explain the concept of superposition in space, with appropriate diagrams. **[3]**

c) Write down the assumptions for deriving the line source solution of the diffusivity equation. **[2]**

Q3) a) What are the objectives of a well test? Explain in detail. **[5]**

b) What do you mean by DST? Explain with its different time phases. **[3]**

c) What is the significance of the multiple buildups and drawdowns in a DST? **[2]**

P.T.O.

Q4) a) How is an isochronal test different from a modified isochronal test? **[5]**

b) Explain why a gas well test is different from an oil well test. **[3]**

c) Explain what is meant by pseudo pressure. **[2]**

Q5) a) What do you mean by method of images? **[5]**

b) Plot pseudo-pressure function vs. pressure, with the help of a graph. Explain. **[3]**

c) Explain the various slopes that are observed in a typical well test. **[2]**

Q6) a) Explain the three types of empirical decline curves. **[4]**

b) What do you mean by IPR and VLP? What happens when they intersect? **[4]**

c) What happens when you change the node position in Nodal Analysis? Explain with graphs. **[2]**

Q7) Write short notes on:

a) Types of graphs used in decline curve analysis. **[5]**

b) Analytical decline curves. **[5]**

Q8) Explain in detail, what do you mean by :

a) Various solutions to the diffusivity equation. **[5]**

b) Bourdet derivative and its impact on pressure transient analysis. **[5]**

Total No. of Questions : 6]

SEAT No. :

P4254

[Total No. of Pages : 2

[5255]-753

M.E. (Petroleum Engineering)

ADVANCED WELL CONTROL

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Discuss Leak off test in detail. **[5]**

b) Influx volume = l0bbl, SIDPP = 500 Psi **[5]**
SICP= 750 psi , TVD = 9,000ft
Mud density = 11ppg, Drill collar = 500 ft,
Annular volume against drill collar = 0.03 bbl/ft
MAASP = 1,200 psi with 11ppg Mud
Calculate influx gradient and maximum influx volume that can be safely shut in.

Q2) a) Explain trip margin in brief. **[2]**

b) Calculate BHP during circulation @90 spm , BHP during lifting the string with pump off **[4]**
Well depth = 11,900ft MD, 9,600ft TVD
Formation pressure gradient 0.65psi/ft
Mud density 12.4 ppg
Annular pressure loss @ 90 spm
Minimum swab pressure 80 psi

c) Discuss gas expansion in riser. **[4]**

P.T.O.

Q3) a) Explain Wait and Weight method in detail. **[5]**

b) Draw Accumulator system and explain functions of two components in brief. **[5]**

Q4) a) Discuss snubbing operation in detail. **[6]**

b) A well started flowing after pulling out 20stand of drill pipe. It was decided to strip the pipe back in to the hole and circulate out the influx using driller's method. Well data given as **[4]**

Well depth 10,000ft, Mud in use 12 ppg,

Drill pipe displacement = 0.0082 bbl/ft

Av. Stand length 92ft

5" drill pipe capacity = 0.0 178 bbl/ft

Calculate: Amount of mud to be bled off after stripping in one stand and amount of mud to be filled in pipe after one stand.

Q5) a) Discuss Diverter system in detail. **[4]**

b) Explain and draw subsea BOP stack. **[6]**

Q6) a) Explain subsea control pod of BOP and discuss working in brief with suitable diagram. **[6]**

b) Write short Note on : **[4]**

i) FOSV

ii) Vacuum degasser.

Total No. of Questions : 8]

SEAT No. :

P4255

[Total No. of Pages : 4

[5255]-754

M.E. (Polymer Engineering)

MATHEMATICAL AND STATISTICAL METHODS

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Solve the following system of equations using Gauss-Seidel method. **[5]**

$$10x_1 - 2x_2 + x_3 = 12$$
$$x_1 + 9x_2 - x_3 = 10$$
$$2x_1 - x_2 + 11x_3 = 20$$

b) Determine numerically largest eigen value of the following matrix A using power method. Also find corresponding eigen vector. **[5]**

$$A = \begin{bmatrix} 10 & -2 & 1 \\ -2 & 10 & -2 \\ 1 & -2 & 10 \end{bmatrix}$$

Q2) a) Find Z-transform of the following (any two) : **[6]**

i) $4^k + 7^k,\ k \geq 0$

ii) $\text{Cos}\ (5k + 4),\ k \geq 0$

iii) $k2^k,\ k \geq 0$

P.T.O.

b) Find inverse Z-transform of the following (any one) : **[4]**

i) $\frac{z}{(z-1)(z-2)}, |z|>2$

ii) $\frac{1}{(z-2)(z-3)}$ using inversion integral method.

Q3) a) Solve the difference equation **[5]**

$$f(k+1)+\frac{1}{2}f(k)=\left(\frac{1}{2}\right)^k,\ k\geq 0,\ f(0)=0$$

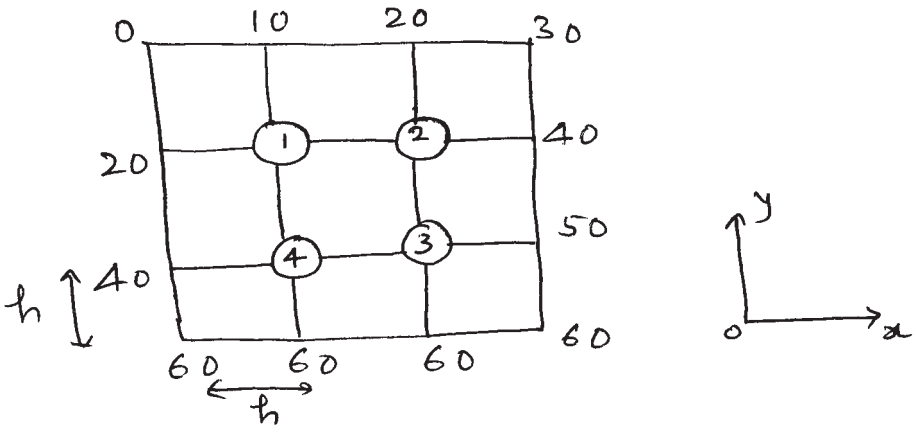
b) Use Gauss Quadrature two point formula to evaluate **[5]**

$$\int_0^1\left(\frac{1}{1+x^2}\right)dx$$

Q4) a) Obtain the solution of differential equation $\frac{dy}{dx}=x^2+y^2$ for y at $x = 1.2$ using Runge-Kutta Fourth order method.
Given $y(1) = 1.5$ with $h = 0.1$ **[5]**

b) Solve Laplace equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ with respect to the following grid.

Find the values of u at nodal points 1, 2, 3 and 4. **[5]**



Q5) a) Using finite difference scheme, solve boundary value problem. **[5]**

$$x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}-1=0,\ y(1)=0, y(1.4)=0.0566,\ h=0.1$$

b) Explain Crank-Niclson implicit finite difference technique for solving one dimensional heat flow problem. **[5]**

Q6) a) Find the extremal of the following functional $\int_{x_0}^{x_1}(y'^2+2yy'-16y^2)dx$.**[5]**

b) Use Galerkin's method to solve boundary value problem
$y'' - y + x = 0, y(0) = 0, y(1) = 0.$ **[5]**

Q7) a) Reduce the following matrix into tridiagonal form using Householder's method. **[5]**

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

b) Use L-U decomposition method to solve following system of equations: **[5]**

$$2x_1 + 3x_2 + x_3 = 9$$
$$x_1 + 2x_2 + 3x_3 = 6$$
$$3x_1 + x_2 + 2x_3 = 8$$

Q8) a) A nationalized bank utilized four windows to render fast service to the customers. On a particular day, 800 customers were observed. They were given service at the different windows as follows : **[5]**

Window Number	1	2	3	4
Number of customers served	150	250	170	230

Test whether customers are uniformly distributed over the windows.

Given $\chi^2_{3:\,0.05} = 7.815$.

b) A fertiliser mixing machine is set to give 12 kg. of nitrate for quintal bag of fertiliser. Ten 100 kg bags are examined. The percentages of nitrate per bag are as follows :

11, 14, 13, 12, 13, 12, 13, 14, 11, 12.

Is there any reason to believe that the machine is defective?

Value of *t* for 9 degrees of freedom is 2.262. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4256

[Total No. of Pages : 2

[5255]-755

M.E. (Polymer Engineering)

PRINCIPLES OF MANAGEMENT

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt Any Five questions.***
2) ***Figures to the right side indicate full marks.***
3) ***Illustrate your answers with suitable examples and diagrams, wherever necessary.***
4) ***Write relevant question number before writing the answer.***

Q1) a) Discuss in brief the management functions as related to trends and challenges in management of global scenario. **[4]**

b) Explain in brief the current trends in management. **[3]**

c) Discuss the various factors affecting on selection of best plant location with reference to polymer industry. **[3]**

Q2) a) Discuss in brief line and staff organization with suitable example. Discuss the merits and demerits also. **[4]**

b) Write a note on Work measurement, time study and motion economy. **[4]**

c) State the utility of sim charts in work study. **[2]**

Q3) a) Discuss in brief decision making steps and process by giving suitable example. **[4]**

b) Write a brief note on: Technological forecasting. **[4]**

c) Define need for inventory control. **[2]**

P.T.O.

Q4) a) Explain the importance of research and development in polymer industry. **[4]**

b) Write a note on price setting methods and strategies. **[4]**

c) Explain the importance of advertising in marketing. **[2]**

Q5) a) What is Combination layout? **[4]**

b) Explain the process of employee training with its various methods and benefits. **[4]**

c) Give the components of typical balance sheet. **[2]**

Q6) a) What is market segmentation? Explain targeting and positioning. **[4]**

b) Discuss the role of concept of creativity in Research and development. **[4]**

c) Explain the role of PERT and CPM techniques in typical polymer engineering projects. **[2]**

Q7) a) A fixed asset having a useful life of 3 years is purchased on 1 January 2016. Cost of the asset is Rs 2 Crore whereas its residual value is expected to be Rs. 50.00 Lakhs. Calculate depreciation expense for the years ending 30 June 2016 and 30 June 2017. **[5]**

b) Explain with suitable examples choice and objectives of technological forecasting. **[5]**

Q8) a) Write notes on: (Any Two) **[5]**

i) Two handed process chart

ii) Capability Maturity Model

iii) Technology Transfer

b) Explain in brief decision-making for cost effectiveness with suitable examples. **[5]**

✷ ✷ ✷

Total No. of Questions : 8]

SEAT No. :

P4257

[Total No. of Pages : 2

[5255]-756

M.E. (Polymer Engineering)

ADVANCE POLYMER TECHNOLOGY

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Write a note on branching and gelation. **[5]**

b) What are hydrophilic polymers? Explain the structural requirements for a polymer to show hydrophilicity. **[5]**

Q2) a) Write a note on fluoroelastomers. **[5]**

b) Explain supramoleculer and metallo-supramoleculer polymers and their applications. **[5]**

Q3) What do you understand by chain microstructure? How is it determined by spectroscopy? **[10]**

Q4) a) Differentiate between nematic and cholesteric phases with suitable diagrams. **[5]**

b) Write a note on heat resistant polymers. Mention the structural requirements. **[5]**

P.T.O.

Q5) a) Explain any one method to prepare graft copolymers. **[5]**

b) Give the mechanism of living cationic polymerization. **[5]**

Q6) a) Elaborate on the use of polymers in lithography. **[5]**

b) Write a note on crystalline melting temperature and glass transition temperature. Also mention the molecular changes taking place during the same. **[5]**

Q7) a) What is phase transfer polymerization? Explain with the help of mechanism. **[5]**

b) Write a note on polymers as catalyst. **[5]**

Q8) a) Explain dendritic polymers and their synthesis. **[5]**

b) Write a note F-H equation. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4258

[Total No. of Pages : 2

[5255]-757

M.E. (Polymer Engineering)

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any 5 questions from the following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of calculator is allowed.***
6) ***Students are permitted to use standard statistical tables having normal distribution area, F-test data, χ^2 test data etc.***

Q1) a) Write a note on "Types and Importance of Research Design." **[4]**

b) Explain the term Hypothesis and what are the characteristics features of a hypothesis. **[3]**

c) Explain various objectives of research. **[3]**

Q2) a) Define research and state the significance of research. **[4]**

b) Differentiate between Action Research and Fundamental Research. **[3]**

c) Explain in detail various sources of review of literature. **[3]**

Q3) a) Write a note on "Methods of Correlation Analysis" **[4]**

b) Explain important methods used for studying variation and also explain different types of averages used in statistical methods. **[4]**

c) Discuss the factors which should be considered while deciding the Sample size and explain how to determine Sample size. **[2]**

P.T.O.

Q4) a) How to collect data and represent it in different forms. Which is best suited for engineering research. **[4]**

b) Explain the procedure of Testing Hypothesis. **[3]**

c) Explain how to carry out linear regression analysis using computer program. What is the significance of R^2 value. **[3]**

Q5) a) Discuss the process of a discrete frequency distribution with one example. **[4]**

b) Explain Tabulation of data. **[2]**

c) Explain different graphical ways of frequency distributions with examples. **[4]**

Q6) a) Explain general outline relating the presentation of report. **[4]**

b) Give Dos and Don'ts of Report writing. **[3]**

c) What are the agencies for submitting the project proposal? **[3]**

Q7) a) Write a note on "Simulated Annealing" **[5]**

b) Explain the basic characteristics of a good report. **[3]**

c) Explain Chi-square test. **[2]**

Q8) a) Explain the term IPR. Which are different categories of IPR **[4]**

b) Explain the term Patent Rights. **[2]**

c) Explain Patents, Designs, Trademarks and Copyright. **[4]**

Total No. of Questions : 8]

SEAT No. :

P4259

[Total No. of Pages : 2

[5255]-758

M.E. (Polymer Engineering)

POLYMER PROCESSING AND TESTING

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Solve any 5 questions from total 8 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain with neat figure, the complete line for sheet extrusion. **[4]**

b) Discuss the effect of channel depth and helix angle on the output in extrusion. **[3]**

c) List the types of products made by the process of rotational molding. **[3]**

Q2) a) What is pressure flow in extruders? Analyze drag flow. **[5]**

b) Discuss the test method used for determination of barrier properties of films. **[3]**

c) Explain the significance of studying flammability properties of plastics. **[2]**

Q3) a) Discuss in details the process of injection molding of thermoplastics. **[5]**

b) Describe in details plug assist thermoforming with neat figures. **[3]**

c) List the various products made by injection stretch blow molding. **[2]**

P.T.O.

Q4) a) Discuss in details the reactive extrusion process. **[4]**

b) Discuss in details construction of molds used in compression molding process. **[3]**

c) Write a detailed note on injection molding of thermosets. **[3]**

Q5) a) Write a short note on transfer molding. **[4]**

b) Explain the calendaring process with neat sketches. **[3]**

c) Write a detailed note on process of rotational molding. **[3]**

Q6) a) Discuss in details the test methods used for determine tensile strength, Young's modulus and creep. **[5]**

b) Discuss the ultrasonic non-destructive test method in details. **[3]**

c) Explain the test method for determining dielectric properties. **[2]**

Q7) a) Explain the process of injection stretch blow molding in details. **[5]**

b) Explain the process of reaction injection molding in details. **[5]**

Q8) a) List the various methods used to study impact properties of plastics. Explain any two in details. **[5]**

b) Discuss roll crowning and cross axis with reference to calendar rolls in details with neat figures. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4260

[Total No. of Pages : 2

[5255]-759

M.E. (Polymer Engineering)

POLYMER PHYSICS AND CHARACTERIZATION

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Solve any 5 questions from total 8 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the viscometry technique used to find out molecular weight of solution. **[6]**

b) Explain working principle of XRD technique **[4]**

Q2) a) TMA usually gives higher values of Tg than those obtained from DSC. Is it true or false? Justify your answer. **[5]**

b) Explain how DSC is used to study kinetics of crystallization. **[5]**

Q3) a) Write a note on detectors used in GPC. **[4]**

b) Discuss about vibration modes seen in FTIR. Draw appropriate diagrams. **[3]**

c) Comment on the information obtained from DTA plots. **[3]**

Q4) a) Write a short note C^{13}-NMR technique. **[5]**

b) Discuss about Isothermal TGA technique and comment on its importance. **[5]**

P.T.O.

Q5) a) Write a short note on small angle light scattering technique. **[5]**

b) Explain any one test method of measuring electrical conductivity of polymers. **[5]**

Q6) a) Explain the terms – wettability, contact angle and spreading coefficient. **[4]**

b) Find out percent crystallinity for following polyethylene samples studied by DSC. Comment on their suitability for impact resistance applications. (Heat of fusion for 100% crystalline polyethylene sample is 290 J/g) **[6]**

Sample	Onset temp.(ºC)	Peak temp.(ºC)	Heat of fusion. ΔH (J/g)
1	121.9	132.9	195.9
2	122.3	131.6	180.1

Q7) a) Comment on importance of storage modulus and loss modulus. **[5]**

b) Explain in detail the technique used to measure polymer creep. **[5]**

Q8) a) Enlist peculiar characteristics of polymer solutions. **[4]**

b) Write a short note on Dynamic Mechanical Analysis technique. **[6]**

Total No. of Questions : 8]

SEAT No. :

P4261

[Total No. of Pages : 2

[5255]-760

M.E. (Polymer Engineering)

POLYMER STRUCTURE AND PROPERTIES

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Solve any 5 questions from total 8 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***

Q1) a) Write a short note on effect of chemical groups on the adhesion. **[5]**

b) Enlist various factors causing polydimethylsiloxane (PDMS) to be one of the most flexible polymers known. **[5]**

Q2) a) Write down short note on "Hydrogen" as side group in different polymers. **[4]**

b) On the basis of chain flexibility explain why rubbers are flexible. **[6]**

Q3) a) With suitable examples explain the concept of Configuration and Conformation. **[4]**

b) Explain fringed micelle model. How it was used to understand the internal morphology in polymer? **[6]**

Q4) a) Comment on the effect of chemical groups on mechanical and thermal properties. **[5]**

b) With suitable examples explain effect of hydrogen bonds on polymer properties. **[5]**

P.T.O.

Q5) a) Explain the folded lamellae model to understand polymer crystallinity. **[5]**

b) Discuss the structure development in polypropylene during injection molding. **[5]**

Q6) a) Write a detailed note on semi-compatible blends. **[5]**

b) Discuss about kinetic factors affecting polymer properties. **[5]**

Q7) a) Elaborate the concept of solubility parameter and its relevance in understanding solubility of polymers. **[5]**

b) Explain the concept of Dynamic and Equilibrium flexibility of polymer chains. **[5]**

Q8) a) In case of PP, why biaxially oriented film has more strength than monoaxially film than unoriented film? **[5]**

b) Enlist factors affecting optical properties of polymers. Discuss any one in brief. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4262

[Total No. of Pages : 2

[5255]-761

M.E. (Polymer Engineering)

POLYMER RHEOLOGY

(2013 Pattern) (Semester - III)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Solve any 5 questions from total 8 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Discuss pseudoplastic fluids and dilatent fluids in details. **[5]**

b) Explain the term normal stress difference with examples. **[5]**

Q2) a) What do understand by the terms storage modulus, loss modulus and loss tangent? **[4]**

b) Explain the construction and working of Brookfield viscometer. **[6]**

Q3) a) Write a detailed note on Doi-Edwards theory. **[6]**

b) Explain how long chain branching affects polymer melts rheology. **[4]**

Q4) a) Explain the terms bulk modulus, shear modulus and Young's modulus in details. **[6]**

b) Explain the Kelvin Voight model in details. **[4]**

P.T.O.

Q5) a) Derive an expression for velocity profile through a circular cross-section for a Newtonian fluid. **[6]**

b) Write a short note on time-temperature superposition. **[4]**

Q6) a) Discuss in details the effect of plasticizers and fillers on polymer melt rheology. **[6]**

b) Explain Bagley's correction. **[4]**

Q7) a) Explain the terms creep and creep compliance. **[4]**

b) Write a short note on Capillary rheometer. **[6]**

Q8) a) Elaborate on Weissenberg's effect. **[4]**

b) Analyze creep and stress relaxation behavior of viscoelastic materials using Standard linear model. **[6]**

Total No. of Questions : 8]

SEAT No. :

P4263

[Total No. of Pages : 2

[5255]-762

M.E. (Polymer Engineering)

TRANSPORT PHENOMENA IN POLYMERS

(2013 Pattern) (Semester - III)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any 5 questions from the following.***
2) ***Figures to the right indicate full marks.***
3) ***Illustrate your answers with suitable examples and diagrams, wherever necessary.***
4) ***Write relevant question number before writing the answer.***

Q1) a) Write a note on Newton's law of viscosity. **[4]**

b) Differentiate between the Newtonian and Non-Newtonian fluids. **[3]**

c) Discuss the Fick's law of diffusion for mass transfer. **[3]**

Q2) a) Derive the expression for momentum flux distribution for flow through circular pipe. **[8]**

b) Explain in detail the term relative volatility. **[2]**

Q3) a) An oil has a kinematic viscosity of $2*10^{-4}$ m^2/sec and density of $0.8*10^3$ kg/m^3. What should be mass rate of flow of this film down a vertical wall will be in order to have a film thickness of 2.5 mm? **[5]**

b) What is permeability of polymers? Discuss the factors affecting on it. **[5]**

P.T.O.

Q4) a) Write a note on heat and mass transfer with phase change. **[4]**

b) Explain single stage extraction operation. **[4]**

c) Differentiate between extraction and leaching. **[2]**

Q5) a) Explain the following terms with suitable example. **[6]**

i) Conduction

ii) Convection

iii) Viscous dissipation

b) List out the applications of solid liquid extraction. **[4]**

Q6) a) Write a short note on single stage leaching operation. **[5]**

b) Carbon disulphide (CS_2) is used to extract iodine from its saturated aqueous solution. The distribution of iodine between carbon disulphide and water at equilibrium is given by (K = X/Y = 588.2). **[5]**
Calculate the concentration of iodine in the aqueous phase if 1 litre of a saturated aqueous solution of CS_2 at 293 K containing 0.3 grams of iodine per 1 litre of water is stirred with 50 ml of carbon disulphide.

Q7) a) Define and explain the Cauchy's principles. **[5]**

b) The feed of 200 kmol/h is liquid and it contains 50 mole % benzene and 50 % toluene and enters at 327.6K. A distillate contains 95 % benzene and 5 mole % toluene and bottoms contain 10 mole % benzene and 90 mole % toluene are to be obtained. **[5]**
Calculate kmol/h of distillate and bottom product.

Q8) a) Explain in detail with neat diagram the Continuous counter current multistage extraction. **[5]**

b) Derive the expression for momentum flux distribution and velocity distribution for steady incompressible flow in annulus. **[5]**

Total No. of Questions : 7]

SEAT No. :

P4264

[Total No. of Pages : 2

[5255]-763

M.E. (Printing Engineering)

PROBABILITY, STATISTICS AND REGRESSION ANALYSIS

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any Five questions.***

2) ***Assume suitable data, if necessary.***

Q1) A lady hits the target 4 times out of 5. If she fire 4 shots, what is probability of: **[10]**

a) More than 2 hits?

b) Exactly 2 hits?

Q2) Random variable X has the following function : **[10]**

Value of X(x)	0	1	2	3	4	5	6	7
P(x)	0	2K	2K	K	3K	K^2	$2K^2$	$7K^2+K$

a) Find K.

b) Evaluate $P(X<6)$; $P(X \geq 6)$, and $P(0<X<5)$.

Q3) Explain types of chart in detail. **[10]**

Q4) Explain OC curve characteristics. **[10]**

P.T.O.

Q5) Explain about planning an experiment with flow chart. **[10]**

Q6) Explain difference between Attribute chart and Variable chart. **[10]**

Q7) Explain how regression analysis is done by using statistical data. **[10]**

Total No. of Questions : 6]

SEAT No. :

P4265

[Total No. of Pages : 1

[5255] -764
M.E. (Printing Technology Management)
PRINTING TECHNOLOGY MANAGEMENT
(2013 Pattern) (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) ***Assume suitable data if necessary.***

Q1) a) Explain with flowchart meaning of organizational structure. **[9]**

b) Explain different types of print products under commercial printing. **[9]**

OR

Q2) Explain any 3 steps involved in shop floor management. **[18]**

Q3) a) What is the meaning of Quality program. State any example. **[8]**

b) Explain how a customer driven quality program is necessary **[8]**

OR

Q4) Explain activities of an inventory department for a book binding process.**[16]**

Q5) Explain the DMAIC. What are the advantages in any processing industry.**[16]**

OR

Q6) Explain types of variation. What is the use of control charts. **[16]**

♦♦♦♦

Total No. of Questions : 3]

SEAT No. :

P4266

[Total No. of Pages : 1

[5255] -765
M.E. (Printing Engineering & Graphic Communication)
MODERN TRENDS IN PRINTING
(2013 Pattern)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Draw neat diagram wherever necessary.***

2) ***Figures to the right indicate full marks.***

Q1) Explain in detail different unit configurations of a flexo press. **[18]**

OR

Explain in detail unit configuration of offset press. **[18]**

OR

Explain in detail process variables of flexo plate. **[18]**

OR

Explain the parameters that affect flexo dot fidelity. **[18]**

Q2) Explain the benefits of ELS system over mechanical line shaft for a press. **[16]**

OR

Explain the effect of impression roller pressure on printability. **[16]**

Q3) Mention the care and maintenance for litho plates. **[16]**

OR

Explain the parameters affecting the contamination of ink. **[16]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P4267

[Total No. of Pages : 1

[5255] -766
M.E. (Printing)
RESEARCH METHODOLOGY
(2013 Pattern)

Time : 3 Hours] ***[Max. Marks :50***

Instructions to the candidates:

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

2) ***Assume suitable data if necessary.***

Q1) What do you mean by research? Explain its significance in modern times. **[10]**

Q2) Explain the points to be consider for selecting the research problem? **[10]**

Q3) Describe source of error in measurement. **[10]**

Q4) Explain the advantages and limitation of case study method for data collection. **[10]**

Q5) Describe steps in writing report. **[10]**

Q6) Describe the layout structure of writing a research report. **[10]**

Q7) Explain research proposal. **[10]**

Q8) Describe the layout structure of writing a research report. **[10]**

♦♦♦♦

Total No. of Questions : 3]

SEAT No. :

P4268

[Total No. of Pages : 1

[5255] - 767
M.E. (Printing Engineering and Graphic Communication)
COLOR SCIENCE
(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) Explain following terms : **[18]**

a) Chromatic aberration of eye

b) Image formation by eye

c) Simultaneous contrast.

Q2) Explain following with respect to ICC profile : **[16]**

a) Architecture

b) Types

c) Models

d) Making of profile

Q3) How does the color and reflection property of material affects the printed color? Explain in details with support of different cases/materials. **[16]**

♦♦♦♦

Total No. of Questions : 3]

SEAT No. :

P4269

[Total No. of Pages : 1

[5255] -768

M.E. (Printing Engineering and Graphic Communication)

WEB HANDLING ON PRESS

(2013 Pattern)

Time : 3 Hours] ***[Max. Marks :50***

Instructions to the candidates:

1) ***Draw neat diagram wherever necessary.***

2) ***Figures to right indicate full marks.***

Q1) Explain the working of video system for print inspection used on a press. **[18]**

OR

Explain the plasma treatment required on the substrate. **[18]**

OR

Explain in detail registration control system for a press. **[18]**

OR

Explain in detail role of tension zones of a web press. **[18]**

Q2) Explain in detail web aligner for a press. **[16]**

OR

Explain in detail deflection of rollers. **[16]**

Q3) Explain the role of web transport rollers in a press. **[16]**

OR

Write notes on : **[16]**

a) Elastomers used on web press

b) Roller Coverings.

♦♦♦♦

Total No. of Questions : 5]

SEAT No. :

P4270

[Total No. of Pages : 1

[5255] -769
M.E. (Printing Engineering)
SUBSTRATE & INK
(2013 Pattern)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***All questions carry equal marks.***
2) ***All questions are compulsory.***
3) ***Assume suitable data, if necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Neat diagrams must be drawn wherever necessary.***

Q1) What is the purpose of substrate sizing? What are the chemicals used for internal sizing? **[10]**

Q2) Explain effect of 'Coating' treatment in paper. **[10]**

Q3) Discuss effect of paper properties on missing dots in offset printing. **[10]**

Q4) Explain various types of specialty inks used in screen printing processes. **[10]**

Q5) Discuss Environmental and Pollution Prevention Laws to be observed in Flexographic printing process. **[10]**

♦♦♦♦

Total No. of Questions : 3]

SEAT No. :

P4271

[Total No. of Pages : 1

[5255] -770

M.E. (Printing Engineering and Graphic Communication)

PRINTED ELECTRONICS AND RFID

(2013 Pattern)

Time : 3 Hours] *[Max. Marks :50*

Instructions to the candidates:

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

Q1) a) Comment on following (any three) **[12]**

i) Stretchable Electronics.

ii) Conventional method of electronics manufacturing

iii) Use of paper and polymer in low cost electronics.

iv) Use of conventional printing methods for electronics manufacturing.

b) Discuss functional inks for use in printed electronics. **[4]**

Q2) Write in detail about printed RFID and its use in supply chain management.**[16]**

Q3) What are functional inks, Explain working of conductive inks. **[18]**

♦♦♦♦

Total No. of Questions : 3]

SEAT No. : ____

P4272

[Total No. of Pages : 1

[5255] -771

M.E. (Printing Engineering & Graphic Communication)

ADVANCES IN CONVERTING AND PACKAGING

(2013 Pattern)

Time : 3 Hours] ***[Max. Marks :50***

Instructions to the candidates:

1) ***Draw neat diagram wherever necessary.***
2) ***Figures to the right indicate full marks.***

Q1) Explain in detail Dry Lamination technique. **[18]**

OR

Explain in detail UV Varnishing process. **[18]**

OR

Explain the converting process for a product. **[18]**

OR

State the security features in packaging. **[18]**

Q2) Explain the shrink and stretch techniques used in packaging. **[16]**

OR

Explain in detail Bag - in - Box for solid products. **[16]**

Q3) Explain in detail packaging techniques used for increased shelf life. **[16]**

OR

Explain in detail retort packaging. **[16]**

♦♦♦♦