Total No. of Questions : 8]

SEAT No. :

P4537

[Total No. of Pages : 3

[4860] - 1001

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

APPLICATIONS OF STATISTICAL METHODS IN CONSTRUCTION

(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) We are interested in finding out electric supply availability of given point of time. Let us consider state electricity board, generator and inverter as three available sources of supply of electricity. Probability of electric supply available from state electricity board is 0.6, probability of electric supply available form generator is 0.95 and probability of electric supply available from inverter is 0.85. What is the probability electric supply is available at given point of time? **[6]**

b) State and explain Baye's Theorem and also properties of Mean of expectation. **[4]**

Q2) a) Transportation trucks carrying goods from hilly areas often face tyre failures due to bad road condition. It is observed that these failures follow Poison distribution with a mean 2 per 1000 kilometres. If a truck driver drives a 1500 kilometres in a given week then: **[5]**

i) What is the probability that it does not have any tyre failures?

ii) What is the probability that it has at least 2 failures?

iii) What is the probability that it has at most 2 failures?

P.T.O.

b) Suppose for a construction company, the average local monthly cell-phone bill is Rs. 427.8. If local monthly cell phone bills are normally distributed with a standard deviation of Rs. 113.5 **[5]**

i) What is the probability that a randomly selected cell phone bill is more than Rs. 677.5?

ii) What is the probability that a randomly selected cell phone bill is between Rs. 300 and Rs. 600?

iii) What is the probability that a randomly selected cell phone bill is no more than Rs. 250?

Q3) a) The following table of ten two digit random numbers is provided to the investigator: **[6]**

34	96	61	85	27
49	78	50	02	13

How should he use this table to select random sample of 5 units out of 30?

b) Explain with the example the various measures of dispersion are useful in the quality control of any construction work. **[4]**

Q4) a) Efficiency tests of two groups of equipment A and B gave the following results

Equipment A : Mean 84, S.D. = 10, $n_1 = 121$

Equipment B : Mean = 84, S.D. = 12, $n_2 = 81$

Is the difference between standard deviation significant. **[5]**

b) A new brand of battery produced by Everyday Company claims that bit has the mean life of at least 65 months. A consumer protection agency tested this claim by using random sample of 15 batteries and found that the mean life as 63 months with a standard deviation of 2 months. Can you conclude that the claim of Everyday Company is correct? **[5]**

Q5) For the data given below **[10]**

x	2	5	1	3	4	1	5	3	4	2
y	50	57	41	54	54	38	63	48	59	46

Find the correlation coefficient between x and y.

Q6) The following data corresponds to length of a plant (x) and age of the plant (y). **[10]**

x	1	2	3	4	6	8
y	2.4	3	3.6	4	5	6

Find regression lines which will help us in predicting x, when y is known & vice-versa.

Q7) a) What is simulation? Explain different types of simulation and state the applications of simulation. **[6]**

b) What is the difference between regression and correlation analysis. **[4]**

Q8) a) Solve the problem on an EOQ production Order Quantity Model. **[6]**

Given Annual Demand, D = 8,000

Daily Production Rate, p = 200

Set up cost, S = 120

Holding cost, H = 50

Production quantity, Q = 400

b) What is the significance of ABC analysis, explain in short. **[4]**

Total No. of Questions : 8]

SEAT No. :

P4406

[Total No. of Pages : 2

[4860]-1002

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

MANAGEMENT AND PROJECT PLANNING IN CONSTRUCTION

(2013 Credit Pattern) (Semester-I)

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

Instructions to the candidates:

1) ***All Questions carry 10 marks each.***
2) ***Attempt any five questions out of Eight.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of Mollier charts, electronic pocket calculator and steam tables is allowed.***

Q1) a) Explain the role of project manager in preparation of project feasibility report. **[5]**

b) List down the direct costs and indirect costs included on a construction project. **[5]**

Q2) a) Discuss Web based project management. **[5]**

b) Write note on project feasibility report based on socio-techno-economic-environmental impact analysis. **[5]**

Q3) Following table gives the data about durations & costs **[10]**

Activity	Time (Weeks)		Cost	
	Normal	Crash	Normal	Crash
1-2	5	2	6000	9000
2-4	6	3	7000	10000
1-3	4	2	1000	2000
3-4	7	4	4000	8000
4-7	9	5	6000	9200
3-5	12	3	16000	19600
4-6	10	6	15000	18000
6-7	7	4	4000	4900
7-9	6	4	3000	4200
5-9	12	7	4000	8500
Indirect Cost: 1000 per week				

P.T.O.

i) Draw the network and find out Critical Path for project.

ii) Find out total project costs.

iii) Carry out stage by stage compression of network.

iv) Find optimal duration & minimum cost.

Q4) a) Explain Line of Balance technique with an example. **[5]**

b) What are the softwares available for construction project scheduling? Give the applications as well as merits and demerits of the same. **[5]**

Q5) a) Write note on application of MIS to construction. **[5]**

b) What type of effective training programme would you suggest for the construction managers dealing with construction of docks and harbor projects? **[5]**

Q6) Write short notes on: **[10]**

a) Work study applications in Civil Engineering

b) Equipment performance rating.

c) Mass haul diagrams.

d) Resource Leveling.

Q7) a) Explain importance of incentives in enhancing workers performance in construction industry. **[5]**

b) Explain in detail safety measures and safety policies to be adopted in construction industry. **[5]**

Q8) a) Write note on workmen compensation Act. **[5]**

b) Write short notes on: **[5]**

i) Merit rating and job evaluation.

ii) String diagram.

x x x

Total No. of Questions : 8]

SEAT No. :

P4653

[Total No. of Pages : 2

[4860]-1003

M.E. (Civil Construction and Management)

CONSTRUCTION TECHNOLOGY

(2013 Pattern)

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

Instructions to the candidates:

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

Q1) With the help of appropriate sketches, for the construction of a micro pile, explain the following.

a) Tube-e-machete and a tam pipe? **[5]**

b) Explain tube-e-machete process of grouting in construction of micro piles. **[5]**

Q2) a) List out locations of electronic sensors provided in a 'Ready Mix Concrete Plant' to measure moisture, for different materials. **[5]**

b) List out the conditions under which you can make use of an R.M.C. plant effectively on the site. **[5]**

Q3) Explain step by step process of Pneumatic sinking of caissons used in a Bridge pier in a creek by Pre-casting and lowering in to the water using Submersible Barges. **[10]**

Q4) Explain method of Pre-casting and lowering a concrete caisson in to the water done by using Inclined Ramps/Slipways. **[10]**

P.T.O.

Q5) For a bridge foundation, steel sheet pile coffer dam is to be constructed. Explain with sketches the sequence of construction of the coffer dam using Larsen 23 section steel sheet piles in completing the pier. foundation and removal of the coffer dam in stages after completion of the foundation? **[10]**

Q6) For the construction of a 6m diameter tunnel in hard rock using Drilling and Blasting Technique, Explian in detail the following operations;

a) Mucking and Dewatering. **[4]**

b) Smoke Clearance and Ventilation. **[3]**

c) Provision of Concrete lining. **[3]**

Q7) In case of cast in situ pile construction, explain;

a) Precautions to be taken to ensure that there is no discontinuity of concrete in the pile shaft. **[5]**

b) Precautions to be taken to ensure that the reinforcement cage in the pile shaft does not collapse. **[5]**

Q8) Write short notes on:

a) Use of concrete Pumps in High Rise Buildings. **[3]**

b) Belt conveyors in Aggregate Crushing plants. **[4]**

c) Chemical Grouting and its applications. **[3]**

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Total No. of Questions : 8]

SEAT No. :

P4538

[Total No. of Pages : 2

[4860] - 1004

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

RESEARCH METHODOLOGY

(2013 Pattern)

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

Instructions to the candidates:

1) ***Solve any 5 full questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

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

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

Q2) a) Discuss in brief the need for a research proposal. **[5]**

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

Q3) a) Write a note on "Internet as sources of literature review". **[5]**

b) Explain in brief various sampling techniques. **[5]**

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

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

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

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

P.T.O.

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

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

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

b) Write a note on "Process of patenting a research idea". **[5]**

Q8) Write a research proposal for a suitable research problem (any problem related to Civil engineering can be considered) to a funding agency with reference to the following terms: **[10]**

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.

Total No. of Questions : 8]

SEAT No. :

P4539

[Total No. of Pages : 2

[4860] - 1005

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

CONSTRUCTION CONTRACTS ADMINISTRATION AND MANAGEMENT

(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Answer any five.***
2) ***Neat sketches must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the role of Planning Commission in India. **[5]**

b) What is breach of contract? And explain its effects. **[5]**

Q2) State general provisions and objectives of Indian Arbitration and Conciliation Act 1996. State duties and power of arbitrators. **[10]**

Q3) Explain the difference between Contracts of Guarantee & Indemnity with suitable example. **[10]**

Q4) Explain arbitration, conciliation & mediation with suitable example. **[10]**

Q5) What is extra item & extra claim? Focus on settlement of claims. **[10]**

Q6) "Workmen's Compensation Act plays a vital role in Construction Industry", Prove the statement. **[10]**

P.T.O.

Q7) What is the difference between contract pricing by Client, PMC and Contractor? **[10]**

Q8) Explain a tendering procedure with invitation of tender for the work, 'Construction of 4 lane road in Municipal Corporation area of cost Rs. 10 crore'. **[10]**

Total No. of Questions : 8]

P4654

SEAT No. :

[Total No. of Pages : 2

[4860] - 1006

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

PROJECT ECONOMICS AND FINANCIAL MANAGEMENT

(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) Discuss the contribution of the Infrastructure sector in the India GDP over global economy? **[5]**

b) As a manager how you define the objectives of your firm and what introductory perusal needed with suitable example? **[5]**

Q2) Write a short notes on **[10]**

a) Working capital

b) Working capital cycle

c) Means of finance

d) Profit and loss account statement

Q3) The cost of machine A and B are 56,225 Rs. each. Depreciation has been charged on straight-line basic and estimated life of both machines is five years. **[10]**

Net Income after depreciation and taxes	Machine A (Rs)	Machine B (Rs)
1st Year	3,375	11,375
2nd Year	5,375	9,375
3rd Year	7,375	7,375
4th Year	9,375	5,375
5th Year	11,375	3,375

P.T.O.

Find out

i) Average rate of return on A and B machines.

ii) Which machines is better from the point of view of payback period and why?

iii) Calculate average rate of return when salvage value of machine A turns out to be 3,000 and when B machine has zero salvage value.

Q4) a) Explain long term sources of finance, merits and demerits of equity shares. **[5]**

b) Describe preference share and its type with each feature? **[5]**

Q5) Discuss in detail the "Cash Budget" as a tool of planning. **[10]**

Q6) a) Discuss the actions taken by CIDC and its recommendations regarding financing requirement of the construction sector. **[5]**

b) Describe ICRA rules and regulation. **[5]**

Q7) a) As a finance manager in a cement factory how you prepare balance sheet with suitable example? **[5]**

b) Describe the role of Escrow account for PPP project. **[5]**

Q8) a) How BOT is effective model for financing in Dam project in India. **[5]**

b) Prepare check list for project appraisal for new contraction of Airport in Pune. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4540

[Total No. of Pages : 3

[4860] - 1007

M.E. (Civil Engg.) (Const. & Mgt.)

OPERATIONS RESEARCH

(2013 Credit Pattern)

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) Minimize **[10]**

$$Z = 3y_1 + 3y_2 + 5y_3$$

Subject to :

$$y_1 + y_2 + y_3 \leq 9$$

$$2y_1 + 3y_2 + 5y_3 \leq 30$$

$$2y_1 - y_2 - y_3 \leq 8$$

$$y_1, y_2, y_3 \geq 0$$

Q2) Sand is to be supplied from four quarry sites to three different RMC plants. The matrix given below presents the unit cost of transportation from each quarry to each of the RMC plant along with the demand and supply data. Find the initial basic feasible solution and allocation by minimum cost method and North west corner rule method. State which method is better. **[10]**

	1	2	3	Supply
1	2	7	4	5
2	3	3	1	8
3	5	4	7	7
4	1	6	2	14
Demand	7	9	18	

P.T.O.

Q3) Four districts are to be assigned to four salespersons. The profit generated by each salesperson in each district is given below. How the districts should be allotted, one per salesperson, so as to maximize the total profit. **[10]**

Employee	**Jobs**			
	1	**2**	**3**	**4**
A	16	10	14	11
B	14	11	15	15
C	15	15	13	12
D	13	12	14	15

Q4) A cement supplier has ten different retailers in three sales areas. The profitability for each retailer in three sales areas is as under: **[10]**

No. of retailers	0	1	2	3	4	5	6	7	8	9	10
Profitability (in lakhs of Rs.)											
Area 1	15	22	30	38	45	48	54	60	65	70	70
Area 2	26	35	40	46	55	62	70	76	83	90	95
Area 3	30	38	44	50	60	65	72	80	85	90	85

Determine the optimum allocation of cement bags to different retailers to maximize the profits.

Q5) Write short notes on: **[10]**

a) Benefit cost ratio analysis.

b) Two phase method in Linear programming model.

c) Degeneracy in Transportation Model.

d) Fibonacci method.

Q6) a) Enlist and discuss the characteristics of Queuing Models. **[5]**

b) A construction site store has a store supervisor at its counter. 9 labourers arrive at the counter on an average of every 5 minutes, while the store keeper can issue items to 10 labourers in 5 minutes. Assuming poisons distribution for arrival rate and exponential distribution for service rate, find **[5]**

i) Average number of labourers in the system.

ii) Average number of labourers in queue or average queue length.

iii) Average time a labourer spends in the system.

iv) Average time a customer waits before being served.

Q7) a) Five jobs are to be processed on two different machines. The jobs should go through the two machines A and B in the order AB. Processing times are tabulated below: **[5]**

Job No.	1	2	3	4	5
Machine A	5	1	9	3	10
Machine B	2	6	7	8	4

Determine the sequence for the five jobs that will minimize the elapsed time.

b) Discuss the procedure of sequencing for processing n jobs through three machines. **[5]**

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

a) Games theory.

b) Replacement model.

c) Steepest Ascent and Descent method.

d) Lagrange Multiplier technique.

Total No. of Questions : 8]

SEAT No. :

P4541

[Total No. of Pages : 2

[4860] - 1008

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

ENERGY AND ENVIRONMENT FOR SUSTAINABLE CONSTRUCTION

(2013 Credit Pattern)

Time : $2\frac{1}{2}$ *Hours]* *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) a) Discuss the pollution potential of construction projects with suitable examples. With suitable reasons justify whether infrastructure projects or real estate projects pollute more. **[5]**

b) Explain the term Environmental Impact Assessment. What are the circumstances under which EIA report is mandated? Discuss the composition of EIA report preparation committee. Enlist the contents of a typical EIA report. Are these contents same for all types of EIA report or are they project specific? Elaborate with suitable example. **[5]**

Q2) a) Explain in detail the importance of green buildings and role played by the civil engineer in them. **[5]**

b) Discuss the energy sector scenario in India. Support your statements with suitable examples and references. **[5]**

Q3) a) Explain the importance of participatory approach and community involvement in making a village self sufficient in its energy requirements. **[5]**

b) Explain the importance of material recycle and reuse in civil engineering from energy and environment perspective. **[5]**

P.T.O.

Q4) a) Discuss in detail how a civil engineer can achieve carbon credits by sustainable construction practices. **[5]**

b) Discuss in detail the UNFCC protocols for carbon trading. **[5]**

Q5) a) Explain in detail the possibility of use of day time solar radiation in public buildings. **[5]**

b) Explain what you understand by socio-environmental impact assessment with an example of hill road construction in tribal areas. **[5]**

Q6) a) What do you mean by the term piezoelectric materials? Explain their importance in civil engineering. **[5]**

b) Discuss the performance factors of thermal power plants with respect to hydro power plants and wind energy plants with merits and limitations. **[5]**

Q7) a) Explain in detail any one new invention in civil engineering that has resulted in achieving work efficiency and sustainability in the field of civil engineering. **[5]**

b) Enlist and explain the roles and responsibilities of different organizations in India related to environment and pollution control. Discuss their jurisdiction details and the procedures involved for getting clearances from these organizations. **[5]**

Q8) a) Enlist various environment protection acts in force in India. Explain the salient features and penalty clauses involved in any two of these acts. **[5]**

b) Discuss the concept of building envelops. Explain with suitable examples the effect of building envelops in regulating the climate and energy requirements of built environment. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4407

[Total No. of Pages : 1

[4860] - 1009
M.E. (Civil) (Const. & Mgmt.)
TQM IN CONSTRUCTION
(2013 Credit Pattern) (Semester - III) (End Semester)

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

Instructions to the candidates:

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

Q1) Discuss the need for implementing TQM programs in the Indian Construction Industry by quoting field examples. **[10]**

Q2) Explain with examples the various quality definitions given by Juran, Deming, Crosby and the ISO 9000. Differentiate between QA and QC, TQC and TQM, with an example each? **[6+4]**

Q3) Explain with examples the use of **[5+5]**

a) Fish bone diagrams

b) Pareto diagrams,

in the quality monitoring & improvements.

Q4) Elaborate on the 5 major heads used in the PRRT software. Discuss advantages of using this software . **[7½+2½]**

Q5) Discuss the 4 categories of quality costs with proper examples. What are hidden costs? What is their impact? Analyze. **[6+2+2]**

Q6) Discuss the utility of the following in quality assessment and improvement

a) Six sigma technique **[5]**

b) Quality control charts. **[5]**

Q7) Elaborate on the following: **[10]**

a) DMAIC

b) PDCA

c) CONQUASS

d) Quality Circle

Q8) Discuss the various problems in implementing TQM programs and suggest remedies to solve them. **[10]**

✦ ✦ ✦

Total No. of Questions : 8]

SEAT No. :

P4408

[Total No. of Pages :1

[4860] - 1010

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

ADVANCE SOIL MECHANICS

(2013 Credit Pattern) (Semester - I) (501121) (End Semester) (Theory)

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) Explain the state of stress at a point with the help of the stress tensor matrix. Also state the meaning of each term in the matrix. **[10]**

Q2) What is pressure bulb? Draw a typical pressure bulb for a concentrated load acting on a soil mass using the Boussinesq's equation. Assume suitable data.**[10]**

Q3) Explain the Bishop's method for stability analysis of finite slopes. Also, state the assumptions. **[10]**

Q4) A retaining wall 4m high supports a backfill ($C = 20 kN/m^2$, $\phi = 30^o$, $\gamma = 20\ kN/m^3$) with horizontal top,flush with the top of the wall. The backfill carries a surcharge of 20 kN/m^2. If the wall is pushed towards the backfill, compute the total passive pressure on the wall and its point of application. **[10]**

Q5) Explain the various modes of failure of retaining wall in detail. Also, state the safety criteria for each mode of failure for complete safety of retaining wall.**[10]**

Q6) Explain how consolidation can be achieved by vertical sand drains with suitable sketch. Also, state its various design aspects. **[10]**

Q7) Explain the flow net construction for hydraulic structures on non-homogeneous soil by suitable example. **[10]**

Q8) Write a short note on "Numerical Analysis of seepage in layered soil". **[10]**

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Total No. of Questions : 8]

SEAT No. :

P4651

[Total No. of Page :1

[4860]-1011

M.E. (Civil) Geotechnical Engineering

GROUND IMPROVEMENT TECHNIQUES

(2013 Credit Pattern)

Time : 3 Hours] *[Maximum 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 five questions.***
5) ***Assume suitable data if necessary clearly mentioning the same.***

Q1) a) Discuss in detail the different clay minerals and how they can be identified? **[5]**

b) Explain the atomic bonds in clay minerals and cation exchange. **[5]**

Q2) a) Explain the changes in the behaviour of soils after chemical stabilisation. **[5]**

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

Q3) a) Explain the soil lime reaction and effectiveness of lime treatment. **[5]**

b) Describe in detail the laboratory tests for stabilised soil. **[5]**

Q4) How is soil stabilisation using flyash and bitumen done? **[10]**

Q5) a) Explain electro-osmosis. **[5]**

b) Write a note on Electro kinetic stabilization. **[5]**

Q6) a) State the vibration methods of deep compaction and explain any one **[5]**

b) Explain the steps involved in design of stone columns. **[5]**

Q7) a) How is bearing capacity of lime group determined? Explain. **[5]**

b) Describe the technique of sand drains. **[5]**

Q8) What are the various types of grouts? Explain grouting equipment and quality control for grouting. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P4542

[Total No. of Pages : 2

[4860] - 1012

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

ROCK MECHANICS

(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Answer any 5 questions from the 8 questions.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator and steam tables is allowed.***
4) ***Assume suitable data if necessary.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain the role of rock engineer in surface excavations of open pit mines. **[5]**

b) Explain the term hydraulic permeability and conductivity of rock. Write the conductivity values of typical rocks. **[5]**

Q2) a) Enlist the various types of rock blasting and explain the cushion blasting in detail. **[5]**

b) Explain the grouting intensity number of a rock. **[5]**

Q3) a) Explain the flat jack method for determining initial stress in rock. Draw the neat sketch. **[5]**

b) Write a detailed note on hydraulic fracturing. **[5]**

Q4) a) Enlist the common laboratory tests for characterizing rock strength and explain unconfined compression test on rock. **[5]**

b) Explain the influence of principal stress ratio on failure of rock. **[5]**

P.T.O.

Q5) a) Explain the Griffith's theory of fracture initiation in rock masses. **[5]**

b) Explain the failure propagation of jointed rocks. **[5]**

Q6) a) What are the essential rock parameters required for analysis of underground structures. **[5]**

b) Explain the principal of limit equilibrium method for the analysis of rock structure. **[5]**

Q7) a) What are the various modes of failure of a footing on rock? Explain any one in detail. **[5]**

b) Write a short note on deep foundation in rocks. **[5]**

Q8) a) What are the modes of hard rock failure explain anyone in detail. **[5]**

b) Write a note on kinematic analysis of rock slopes. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4543

[Total No. of Pages : 2

[4860] - 1013

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

RESEARCH METHODOLOGY

(2013 Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Solve any 5 full questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

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

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

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

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

Q3) a) Enlist few renowned journals in civil engineering which can be used as sources of literature review. **[2]**

b) Define sampling and discuss the different types of sampling. **[8]**

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

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

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

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

P.T.O.

Q6) a) Explain the z-test and t-test used for hypothesis testing. **[5]**

b) Explain Type I and Type II errors in context of "Testing of hypothesis". **[5]**

Q7) a) Discuss the precautions to be taken for writing Research Reports. **[5]**

b) Write differences between: **[5]**

i) A journal paper.

ii) A research report.

iii) A research thesis.

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: **[10]**

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.

Total No. of Questions : 8]

SEAT No. :

P4544

[Total No. of Pages : 3

[4860] - 1014

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

ADVANCE FOUNDATION ENGINEERING

(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Answer any 5 questions from 8 questions.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator and steam tables is allowed.***
4) ***Assume suitable data if necessary.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain the method of underwater sampling for collecting soil samples for port structure site. **[5]**

b) The dimensions of two thin-walled sample tubes are as follows: **[5]**

Outer Diameter (mm)	Inner Diameter (mm)	Length (mm)
76.2	73	610
89	86	610

Calculate the area ratio for each of these two sample tubes. Also comment on the kind of sample disturbance on sample collected by using each tube.

Q2) a) Explain the direct cone penetration test and discuss the DCPT correlation for cohesive soil. **[5]**

b) Calculate the corrected SPT number for a field test conducted on a sandy soil. The test was conducted at depth of 2m from GL and observed SPT number is 12. It is also observed that water table is 1m below GL. Take γ = 18.5 kN/m^3 and Correction factor = 1.4. **[5]**

P.T.O.

Q3) a) The square footing that is vertically and concentrically loaded is to be placed on a cohesionless soil. The soil and other data are as follows: **[8]**

i) Footing Size = 2.5m X 2.5m placed at depth of 1.1m below GL.

ii) Location of GWT = 1.95m below GL.

iii) γ = 18.10 kN/m^3, $\varnothing_u$ = 35°, c = 0, Nq = 33.0, Ny = 34.0

iv) Natural moisture content w = 10% & G = 2.68,

v) Factor of safety = 2.0

Compute the allowable bearing capacity using Hansen equation.

b) Explain the term local shear failure with reference to Terzaghi's bearing capacity failure. **[2]**

Q4) a) Explain the bearing capacity of raft foundation with help of bearing capacity equations. **[5]**

b) Write a note on approximate Flexible method of raft foundation design. **[5]**

Q5) a) Discuss the various stability check involved in the design of cantilever sheet pile wall. **[5]**

b) Write a note on Sheet-pile Anchorages. **[5]**

Q6) a) A pile tip is resting onto a dense medium-coarse sand deposit. The sand deposit has an average N_{70} = 30 in the zone of influence of about 1.5m above the tip to 3m below. The pile is of 7m length and HP 36 x 174 with d x b = 361 x 378 mm. The GWT is 5m below the ground surface. Estimate the point capacity by using Hansen's method.

Take γ_{sand} = 17.0 kN/m^3, $\varnothing$ = 36°, Nq = 37.7 and Ny = 40.0, depth factor = 0.24. **[6]**

b) Write a note on tension piles. **[4]**

Q7) a) Enlist the various methods of coffer dam design and explain TVA method in detail. **[6]**

b) Discuss the various reasons which causes instability of cofferdam. **[4]**

Q8) a) Explain the various components and types of loading on well foundation. **[6]**

b) Write a note on sinking procedure of well foundation. **[4]**

Total No. of Questions : 8]

SEAT No. :

P4648

[Total No. of Pages : 2

[4860]-1015

M.E. (Civil) (Geotechnical Engineering)

CONSTRUCTION METHODS IN GEOTECHNICAL ENGINEERING

(2013 Pattern)

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

Instructions to the candidates:

1) ***Answers <u>any five</u> questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicates full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary, clearly mentioning the same.***

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

b) Describe the procedure of construction of cast-in-situ piles. **[5]**

Q2) Explain the different bracing systems for cofferdams and its installation process. **[10]**

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

Q4) Discuss the difficulties in cofferdam construction with neat sketches (Any two) **[10]**

Q5) What are the different considerations in caissons and describe the site and foundation preparation for caissons? **[10]**

Q6) a) Explain the construction of steining and its sinking for open caisson. **[5]**

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

P.T.O.

Q7) Explain the criteria for blast design including explosive selection, hole design and describe the loading & hauling equipment for blasting. **[10]**

Q8) What are the methods of tunneling? Explain multi-stage and shield tunneling method. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P4409

[Total No. of Pages :1

[4860] - 1016

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

STABILITY OF SLOPES & EARTH DAMS

(2013 Credit pattern) (Semester - II) (501128) (End Sem.) (Theory)

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) ***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) Explain the total and effective stress methods of slope stability analysis. Also, explain the location of critical slip surface for stability analysis. **[10]**

Q2) Explain the stability of down stream side slope during steady seepage with an equation to calculate factor of safety. **[10]**

Q3) Derive the equation $q = \sqrt{Kx \cdot Ky} \cdot h \frac{Nf}{Nd}$ to calculate seepage discharge for anisotropic soil. **[10]**

Q4) What are the various causes of failure of earth dam? Explain with suitable sketches. **[10]**

Q5) What are the objectives of Instrumentation in earth dams? Explain the various types of piezometers used and their functions. **[10]**

Q6) Draw a typical rail embankment and explain the functions of each component. **[10]**

Q7) Explain the use of geotextiles in embankments on soft soils as a reinforcement. Also, comment on cost- benefits of Geotextiles. **[10]**

Q8) Write a short note on: **[10]**

a) Gabions.

b) Shotcreting.

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Total No. of Questions : 8]

SEAT No. :

P4410

[Total No. of Pages : 1

[4860] - 1017

M.E. (Civil) (Geotech. Engg.)

GEOTECHNICAL EARTHQUAKE ENGINEERING

(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) ***All questions carry equal marks.***
4) ***Your answers will be valued as a whole.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain 'Elastic Rebound Theory'. **[5]**

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

Q2) a) Compare 'Continental drift' & 'Plate Tectonics'. **[5]**

b) Explain 'Ground Motion Parameters' & its estimation. **[5]**

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

b) Discuss the effects of local site conditions on ground motion. **[5]**

Q4) a) Discuss ' 2-D Ground Response Analysis'. **[5]**

b) Explain 'Green's Function Technique'. **[5]**

Q5) a) Explain 'Seismic Scope Stability Analysis'. **[5]**

b) Discuss 'Seed & Martin' Approach. **[5]**

Q6) a) Discuss 'Initiation & effects of Liquefaction'. **[5]**

b) Explain 'Dynamic Analysis for Earthdam. **[5]**

Q7) a) Explain 'Seismic Design of RE wall'. **[5]**

b) How will you improve BC of foundations, during EQ? **[5]**

Q8) a) Explain 'Grouting & Soil reinforcement technique'. **[5]**

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

Total No. of Questions : 8]

SEAT No. :

P4411

[Total No. of Pages : 2

[4860]-1018

M.E.(Civil) (Geotechnical Engineering)

GEOENVIRONMENTAL ENGINEERING

(2013Credit Pattern) (Semester-III)

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

Instructions to the candidates:

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

Q1) a) Write in detail about "Identification of waste". **[5]**

b) Explain biological characteristics of solid waste. **[5]**

Q2) a) Explain in detail regulatory requirements for disposal of domestic waste. **[5]**

b) Write detail note on "soil-waste interaction". **[5]**

Q3) a) Explain "cation exchange reactions and effect of solid waste pollutants on soil properties". **[5]**

b) Write the necessity of "Recycling and Reuse" of waste. **[5]**

Q4) a) Explain about laboratory and field evaluation of permeability. **[5]**

b) Write detail note on "Leachet collection and detection system". **[5]**

Q5) a) Explain in detail "Waste contaminant principle". **[5]**

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

P.T.O.

Q6) a) Write the necessity of "Environmental monitoring around landfills". **[5]**

b) Explain design aspects of waste disposal in landfills. **[5]**

Q7) a) Explain in detail "Geotechnical reuse of waste-advantages & limitations". **[5]**

b) Explain in detail with neat sketch "double liner landfills". **[5]**

Q8) a) Explain with any of the case study "Reclamation of old waste dumps". **[5]**

b) Write detail note on "Geosynthetic applications in waste disposal". **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4545

[Total No. of Pages : 2

[4860] - 1019
M.E. (Civil) (Hydraulic Engg.)
FLUID MECHANICS
(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) State assumptions made in Bernoulli's theorem. What are limitations of Bernoulli's theorem. **[4]**

b) Derive continuity equation in cylindrical polar coordinate system. **[6]**

Q2) a) Prove that potential function exit for those fluid cases in which the motion is irrotational. **[6]**

b) Write a short note on graphical method of solving Laplace equation. **[4]**

Q3) a) Given the complex velocity potential $w = \log_e z^2$. Evaluate the stream function and velocity potential functions. **[4]**

b) Water flows between two horizontal plates kept 4 m apart. The lower plate is stationary while the upper plate moves with a velocity of 0.5 m/s to the right. Find the pressure gradient such that the shear stress at the lower surface is zero. Viscosity of water 20ºC is 0.001 N-s/m^2. **[6]**

Q4) a) Derive equation for stream function and velocity potential for a doublet. Draw the stream lines and potential lines. **[5]**

b) Derive equation for velocity distribution for an oscillating plate in laminar flow starting with Navier-Stoke equations. **[5]**

P.T.O.

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

b) Derive Karman momentum integral equation to determine the boundary layer thickness. **[6]**

Q6) a) A flat plate is exposed to a fluid flow with a free stream parallel to the axis of the flow. In another case this plate is replaced by another plate of half the length of the previous plate, all other conditions remaining unaltered. In both the cases flow over the entire length of the plate is laminar. Determine the ratio of the drag coefficients for these two cases. **[6]**

b) Write a short note on Karman - Pohlhausen method for solution of momentum integral equation. **[4]**

Q7) a) Derive Reynold's equation of motion. **[5]**

b) Discuss the analogy between the normal shock wave and the hydraulic jump. **[5]**

Q8) a) Discuss factors affecting transition from laminar to turbulent flow. **[5]**

b) Derive equation for work done in adiabatic process. **[5]**

Total No. of Questions : 8] **SEAT No. :**

P4564 **[Total No. of Pages : 2**

[4860] - 1020

M.E. (Civil - Hydraulics Engineering)

IRRIGATION AND DRAINAGE

(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

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

Q1) Calculate the depth and frequency of irrigation required for a crop pattern having the following data. **[10]**

i) Root zone depth = 1m

ii) Field Capacity = 18%

iii) Wilting point =11%

iv) Specific Weight of Soil = 1.50gm/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 do you mean by soil erosion ? Describe soil erosion by considering following parameters **[10]**

i) Causes of Soil Erosion

ii) Effects of Soil Erosion

iii) Preventing Soil Erosion

P.T.O.

Q3) With the help of neat sketch describe the design procedure for drip irrigation system. **[10]**

Q4) With the help of neat sketch explain lift irrigation scheme? Explain the meaning of economics of lift irrigation scheme and state the criteria for the justification of the execution of such scheme. **[10]**

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 command area? Explain it by considering the following points Command area - need, scope, and development approaches. **[10]**

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

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

i) Design and construction of drainage system

ii) Water logging

Total No. of Questions : 8]

SEAT No. :

P4412

[Total No. of Pages : 2

[4860]-1021

M.E.(Civil-Hydraulic Engineering)

PLANNING AND MANAGEMENT OF WATER RESOURCES

(2013CreditPattern) (Semester-I)

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

Instructions to the candidates:

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

Q1) a) Elaborate the necessity of water resources management. **[5]**

b) Discuss the fact that 1% reduction in monsoon rainfall results into 0.1% reduction in GDP India. **[5]**

Q2) a) Briefly explain strategy of water resources management. **[5]**

b) Interlinking of rivers may prove to be a booster for indian economy-discuss. **[5]**

Q3) a) Write a note on elasticity of water demand. **[5]**

b) State guiding principles for cost allocation of a multipurpose project. **[5]**

Q4) a) State five feasibility criteria for a water resources project. **[5]**

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

Q5) a) Write a note on supply and demand hydrograph of water for a distribution reservoir. **[5]**

b) Explain the role of reservoir in controlling flood. **[5]**

Q6) a) Write a note on uncertainties in water resources systems. **[5]**

b) State the standard operating policies of a multipurpose reservoir. **[5]**

P.T.O.

Q7) a) Briefly discuss about judicious use of surface and ground water resource. **[5]**

b) Write a note on management of Bhima river basin. **[5]**

Q8) a) With suitable example explain the conjunctive use of surface and ground water resources? **[5]**

b) For an investment of Rs.1,00,000, Which of the following three alternatives is economically superior? **[5]**

i) The amount becomes double in 6years.

ii) The amount can be invested at 12% interest, compounded half yearly.

iii) The amount will be returned in three equal installments of RS.52,000,each at the end of every 2 years.

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Total No. of Questions : 8] **SEAT No. :**

P4565 **[Total No. of Pages : 2**

[4860] - 1022

M.E. (Civil) (Hydraulics)

RESEARCH METHODOLOGY

(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

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

Q1) a) Explain the errors in selecting a research problem. **[5]**

b) Explain the difference between Research Methods and Research Methodology. **[5]**

Q2) a) Enlist various Research funding agencies. Discuss about any one in detail. **[5]**

b) With suitable example explain Quantitative research. **[5]**

Q3) a) Explain the significance of Literature review in Research. **[5]**

b) Discuss the sources of error in measurement. **[5]**

Q4) a) Discuss the advantages of Likert-type Scaling method. **[5]**

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

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

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

P.T.O.

Q6) a) Write a note on "Analysis of Variance". **[5]**

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

Q7) a) Discuss the steps involved in publishing a research idea in a journal. **[5]**

b) Write a note on "Plagrism in 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. :**

P4566 **[Total No. of Pages : 2**

[4860] - 1023

M.E. (Civil) (Hydraulic Engineering)

OPEN CHANNEL HYDRAULICS

(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) Derive 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) Derive relation between sequent depths in case of hydraulic jump on sloping floor. **[6]**

Q2) a) Describe constriction in width of channel for upstream flow subcritical. **[6]**

b) Write a short note on control of hydraulic jump by jump at an abrupt drop. **[4]**

Q3) a) Starting from basic principles derive an expression for GVF for a wide rectangular channel in the form **[6]**

$$\frac{dy}{dx} = S_o \frac{1 - \left(\frac{y_n}{y}\right)^{10/3}}{1 - \left(\frac{y_c}{y}\right)^3}$$

b) Write a short note on C profiles. **[4]**

P.T.O.

Q4) a) 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]**

b) Write a short note on H_2 profiles. **[2]**

Q5) a) 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
Inflow m^3/s	10	20	50	60	55	45	35	27	20	15

b) Explain any two SVF profiles on bottom racks with sketches. **[4]**

Q6) a) What is flood routing? Distinguish between reservoir routing and channel routing. **[5]**

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

Q7) a) Derive dynamic equation of gradual varied unsteady flow. **[5]**

b) Derive equation for celerity of a solitary wave. **[5]**

Q8) a) Explain types of surges. **[5]**

b) Derive equation for velocity in a dam break problem. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4567

[Total No. of Pages : 2

[4860] - 1024

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

SEDIMENT TRANSPORT AND RIVER MECHANICS

(2013 Pattern)

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

Instructions to the candidates:

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

Q1) Define sediment, Enlist the nature of sediment problems and Discuss any five in detail. **[10]**

Q2) State the various approaches to the initiation of sediment motion. Explain in detail "shields' analysis" for the initiation of sediment motion. **[10]**

Q3) Briefly explain the various modes of sediment transport. **[10]**

Q4) Write short notes on : **[10]**

a) Assumptions in Einstein's bed load function.

b) Suspended load distribution.

Q5) a) Compare Kennedy's method and Lacey's method. **[5]**

b) Design a stable channel in alluvial soil to carry a discharge of 600 m^3/s by using Lacey's method. The mean size of sediment particles is 0.04 mm. **[5]**

Q6) Explain the various methods for controlling the sedimentation of reservoirs. Also mention the effectiveness of each measure for sediment control. **[10]**

P.T.O.

Q7) Write short notes on : **[10]**

a) Groynes-concepts-applications-types.

b) Elements of river morphology.

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

a) Alluvial river models.

b) Sediment transport through pipes.

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Total No. of Questions : 8]

SEAT No. :

P4568

[Total No. of Pages : 2

[4860] - 1025

M.E. (Civil) (Hydraulics)

HYDROLOGY

(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figure to the right indicates 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) Differentiate between DAD &IDF curves. Explain the preparation and uses of DAD Curves. **[6]**

b) Explain the deconvolution method for deriving unit hydrograph for complex storm. **[4]**

Q2) a) Explain the utility of Rainfall-Runoff models and explain non linear reservoir model. **[6]**

b) Explain the various infiltration equations for deriving the infiltration capacity curves. **[4]**

Q3) a) Explain the various classification of Stochastic process and explain Markov process. **[5]**

b) What are probability distribution function and explain method of moment for fitting a probability of distribution. **[5]**

P.T.O.

Q4) a) Explain 1) Probable maximum flood, 2) Standard project flood, 3) flood of specific return period. **[6]**

b) An water course has an fall of 3m in a legth of 45m. The water course flows through grassland of area 2.5 km^2 rough country of 2.0 km^2, & forest of 1.5 km^2.The run off coefficient for the above region have a value of C_1 = 0.35, C_2 = 0.45 & C_3= 0.10. Estimate the peak rate of run off for return period of 20 years. The I-F-D relation is given by **[4]**

$$I = \frac{80\,(T_r)^{0.2}}{(t + 13)^{0.46}}$$

Q5) a) What are the different frequency distribution function for prediction of extreme flood value. Explain Gumbel method for extreme value in hydrologic studies. **[6]**

b) Explain 1) Risk and Reliability & 2) Safety factor. **[4]**

Q6) a) Explain the difference between Darcy velocity and actual velocity. Derive the equation for Darcy velocity and express the Darcy velocity for 3D anisotropic media. **[5]**

b) Derive the equation for discharge of a steady radial flow to a well in an unconfined aquifer. **[5]**

Q7) a) Compute the transmissivity and hydraulic conductivity of an aquifer 10m thick & 15cm diameter which is pumped at a rate of 0.0020m^3/s. The drawdown observed in 2 wells located at 15m & 55m from centre of well are 3.2m & 0.07m respectively. **[4]**

b) Explain the effect of well interference on drawdown of a pumped well. What are the different methods of estimation of aquifer parameters. **[6]**

Q8) a) What are the basic criteria to be satisfied in water well design and explain the role of 1) Well diameter and 2) Well depth , in the well design. **[5]**

b) What is groundwater pollution? Discuss non point source of groundwater pollution. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4413

[Total No. of Pages : 2

[4860]-1026
M.E.(Civil-Hydraulic Engineering)
DAM ENGINEERING
(2013 Credit Pattern) (Semester-III)

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

Instructions to the candidates:

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

Q1) a) Explain the methods to control thermal stresses in concrete gravity dam during construction stage. **[5]**

b) What is elementary profile of a gravity dam? Derive the equation to calculate base width of elementary profile for no tension condition. **[5]**

Q2) a) Write a note on colgrout masonry. **[5]**

b) What is middle third rule? In reservoir empty condition, the resultant has crossed the limit of middle third; suggest the design modification to bring it within limit **[5]**

Q3) a) Differentiate between constant angle and constant radius arch dams. **[5]**

b) Write a note on impervious membrane typerockfill dam. **[5]**

Q4) a) Briefly explain cupola arch dam. **[5]**

b) Briefly explain types of buttress dams. **[5]**

Q5) a) Briefly explain various components of earthen dam and their functions. **[5]**

b) What is phreatic line? How it is developed from Kozeny's base parabola. **[5]**

P.T.O.

Q6) a) Briefly explain different causes of failures of earthen dam. **[5]**

b) Write a note on downstream slope protection of earth dam? **[5]**

Q7) a) Design suitable hydraulic jump type stilling basin with horizontal slope for tail water deficiency condition with following data. **[5]**

i) Design discharge = 1650 m^3/s

ii) Width of spillway = 55m

iii) Supercritical depth at foot of spillway = 2m

b) Explain the working principle of strain meters. **[5]**

Q8) a) Briefly explain the planning of installation of various instruments for monitoring health of dam. **[5]**

b) How the hoisting capacity of spillway gate is determined? **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4414

[Total No. of Pages : 5

[4860]-1027
M.E.(Civil-Hydraulics)
OPTIMIZATION TECHNIQUES
(2013 Credit 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 side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Define a system. Explain the characteristics of water resources systems. **[3]**

b) Solve the following LPP by Simplex method. **[7]**

Maximize $Z = 4x_1 + 5x_2 + 9x_3 + 11x_4$

subject to

$$x_1 + x_2 + x_3 + x_4 \leq 15$$

$$7x_1 + 5x_2 + 3x_3 + 2x_4 \leq 120$$

$$3x_1 + 5x_2 + 10x_3 + 15x_4 \leq 100$$

$$x_1 \geq 0,\ x_2 \geq 0,\ x_3 \geq 0,\ x_4 \geq 0$$

Q2) a) Determine the feasible region for the following problem. **[5]**

Minimize $Z = 4x_1 + 6x_2$

St $2x_1 + 5x_2 \geq 10$

$3x_1 + 2x_2 \geq 6$

$x_1 \geq 0,\ x_2 \geq 0$

i) Using graphical means, determine the optimal solution.

ii) If the objective function changes to $Z = x_1 + 8x_2$, will there be a different optimal solution.

P.T.O.

b) Find the minimum of the function $f = \lambda^5 - 5\lambda^3 - 20\lambda + 5$ by dichotomous search in the interval (0,5) with $\delta = 0.0001$. **[5]**

Q3) a) Profit derived by the three farmers for the amount received is given in the following table. **[5]**

Profit derived

Amount of water delivered	Farmer 1	Farmer 2	Farmer 3
0	0	4	-1
1	2	3	4
2	4	4	5
3	6	4	5
4	3	6	4
5	3	5	3

The maximum quantity of water available is 4 units.Solve the problem by DP technique.Formulate the recursive equations.

b) Find the minimum of the function $f = \lambda^5 - 5\lambda^3 - 20\lambda + 5$ by Fibonacci search in the interval(0, 5). **[5]**

Q4) a) Water is to be allocated to 3 farmers in an irrigation management so as to maximize the return. Formulate a dynamic programming problem defining the various terminologies used. **[5]**

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

Q5) a) Four jobs 1,2,3 and 4 are to be processed on each of the five machines A,B,C,D and E in the order ABCDE. Find the total minimum elapsed time if no passing of jobs is permitted. Also determine idle time for each machine. **[6]**

Job/machine	A	B	C	D	E
1	7	5	2	3	9
2	6	6	4	5	10
3	5	4	5	6	8
4	8	3	3	2	6

b) What is mean by decision making with experimentation? **[4]**

Q6) a) Explain decision tree analysis with a suitable example. **[6]**

b) A self service store employs one cashier at its counter.Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes.Assmuing Poisson distribution for arrival rate and exponential distribution for service time,find **[4]**

i) Average number of customers in the system.

ii) Average number of customers in the queue or average queue length.

iii) Average time a customer spends in the system.

iv) Average time a customer waits before being served.

Q7) a) Explain simple game with prototype example. **[4]**

b) The occurrence of rain in a city on a day is dependent upon whether or not it rained on previous day. If it rained on the previous day, the rain distribution is given by. **[6]**

Event	Probability
No rain	0.5
1cm rain	0.25
2cm rain	0.15
3cm rain	0.05
4cm rain	0.03
5cm rain	0.02

If it did not rain the previous day, the rain distribution is given by

Event	Probability
No rain	0.75
1cm rain	0.15
2cm rain	0.06
3cm rain	0.04

Simulate the city's weather for 10 days and determine by simulation the total days without rain as well as the total rainfall during the period.Use following random numbers:67,63,39,55,29,78,70,06,78,76for simulation.Assume that for the first day of the simulation it had not rained the day before.

Q8) a) Explain the Monte Carlo simulation with suitable example. **[4]**

b) Reduce the following game by dominance property and solve it: **[6]**

Player B

Player A	I	II	III	IV
I	3	2	4	0
II	3	4	2	4
III	4	2	4	0
IV	0	4	0	8

Total No. of Questions : 8]

SEAT No. :

P4569

[Total No. of Pages : 2

[4860] - 1028

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

ADVANCED MECHANICS OF SOLIDS

(2013 Credit Pattern)

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) With neat sketch, show all the rectangular components on an element in a stress elastic body. Hence obtain differential equation of equilibrium. **[4]**

b) A plane passing through a point (x, y , z) in a stressed elastic body has its normal n with direction cosine cos(n, x), cos (n, y) and cos(n, z). Obtain expression for the resultant stress (T_n) and its direction in terms of the six independent stress components at the points. **[6]**

Q2) a) Define Airy's stress function. Prove that the stress function ϕ satisfying the governing equation $\nabla^4\phi = 0$, when the body force is absent. **[7]**

b) State and explain generalised Hook's law. **[3]**

Q3) a) Obtain differential equation of equilibrium of plane elasticity problem in polar co ordinate with usual notation. **[6]**

b) Obtain strain displacement relationship for the six independent strain components in an elastic body. **[4]**

P.T.O.

Q4) a) Derive an expression for radial (σ_r) and tangential (σ_t) stresses for thick cylinder of internal radius (r_i) and external radius (r_0) subjected to internal pressure (p_i). **[5]**

b) Obtain Naviers and Lames equations of equilibrium. **[5]**

Q5) a) Determine the numerical value of the ratio $\sigma_{max}/\sigma_{min}$ for the case of pure bending of a curved beam in elevation having rectangular cross section of 25 mm × 25 mm if the radius of curvature of the centroidal axis is 37.5 mm. **[5]**

b) Analysis the simply supported semicircular beams of radius r curved in Plan, subjected to uniformly distributed load w, supported on three equally spaced columns. **[5]**

Q6) a) Derive an expression, $\sigma = \dfrac{My}{A\bar{y}\,(r - y)}$ for bending stress of a curved beam in elevation with usual notation. **[5]**

b) Derive an expression for defection at free end for a cantilever quarter circle curved beam of radius r in plan subjected to point load W at the free with usual notation. **[5]**

Q7) a) State and explain in brief St. Venant's theory of torsion. **[4]**

b) Assuming proper stress function for a bar of equilateral triangular cross section subjected to torque T, determine the maximum shear stress and its location. **[6]**

Q8) a) Find differential equation for beam on elastic foundation subjected to downward uniformly varying load (w) per unit distance and to an upward force of ky per unit distance, where k is the stiffness modulus of the elastic foundation. **[5]**

b) An infinite elastic beam is subjected to uniformly distributed load on finite length. Obtain slope, deflection. Moment and shear. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4647

[Total No. of Pages :2

[4860]-1029
M.E. (Civil) (Structures)
STRUCTURAL DYNAMICS
(2013 Pattern)

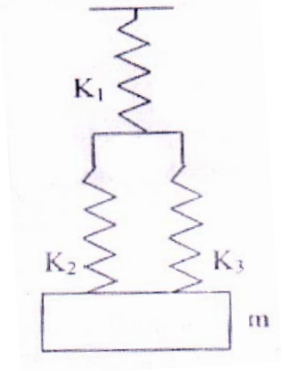
Time : 3 Hours] *[Maximum Marks : 50*

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.***

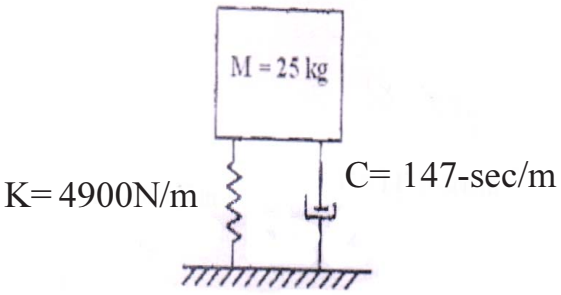
Q1) a) Derive an expression for equivalent spring constants for springs arranged in series and in parallel for representing stiffness K. **[5]**

b) Find the natural frequency of the system shown in figure 1. Given $K_1=K_2=1500N/m$, K3=2000N/m and m= 5kg. **[5]**



Q2) a) Derive an expression for free vibrating undamped single degree of freedom system. **[5]**

b) A 25 kg mass is resting on a spring of 4900 N/m and dashpot of 147 N-se/m in parallel. If a velocity of 0,10 m/sec is applied to the mass at the rest position, what will be its displacement from the equilibrium position at the end of first second? **[5]**

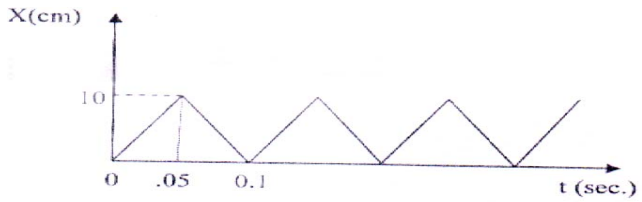


P.T.O.

Q3) a) Using Duhamel's integral determine Dynamic loading factor for Step force applied undamped oscillator. **[5]**

b) A machine part of mass 2.5 Kgs vibrates in a viscous medium. A harmonic exciting force of 30 N acts on the part and causes resonant amplitude of 14 mm with a period of 0.22 sec. Find the damping coefficient. **[5]**

Q4) A periodic motion observed on the oscilloscope is shown in figure 3 represent the displacement equation by harmonic series. **[10]**

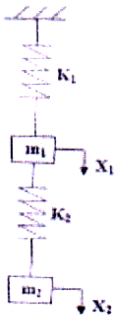


Q5) a) Write short note on Newmark's method. **[5]**

b) Derive the expression for multidegree of freedom system and application of Eigen vector and Eigen value for determining natural frequency and mode shapes. **[5]**

Q6) a) Show that modes are orthogonal to each other. **[3]**

b) Obtain the frequency equation for the system shown in figure. Also determine the natural frequencies and mode shapes when K1 = 4K, K2 = 3K, ml = 2m, m2 = 3m. **[7]**



Q7) a) Write a note on mode superposition method for MDOF system. **[5]**

b) Write short note on Non linear analysis using Wilson Theta. **[5]**

Q8) Derive an expression for natural frequency of simply supported beam which resembles a continuous system. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P4415

[Total No. of Pages : 2

[4860] - 1030

M.E. (Civil - Structures)

ADVANCED DESIGN OF STEEL STRUCTURES

(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

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

Q1) a) Draw line sketches for different types of hoarding systems used. **[4]**

b) The forces coming in a member of a hoarding structure are 200 kN tensile and 150 kN compressive due to reversal of stresses due to wind load. Design the member using double angle section back to back on opposite faces of 8 mm thick gusset plate using M20 black bolt of 4.6 grade. Assume Fe-415 grade of steel. Draw the design sketch. Take length of member as 3.0 m. **[6]**

Q2) a) Briefly state the guidelines to be followed for web openings and stiffeners to be used in design of castellated beams. **[3]**

b) Design a castellated beam in grade Fe410 steel to carry an imposed load of 4.5kN/m and dead load of 2.5 kN/m over a simply supported span of 10m. Assume that the compression flange is fully restrained. **[7]**

Q3) a) What are the various forces to be considered in design of Microwave tower and transmission tower? **[4]**

b) A 35 m high microwave antenna lattice tower is to be built near Pune 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 2.5 m. The width of the tower at the top has to 2.5 m. Select a suitable configuration for the tower and determine maximum compressive force and tension in the tower legs and also the maximum shear at the base, for the following data. **[6]**

P.T.O.

Weight of antenna disc and fixtures : 6kN

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

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

Weight of ladder and the cage : 0.45kN/m

Weight of miscellaneous item: 2.5kN

Q4) a) List out the types of bracings used with their advantages. **[4]**

b) Explain structural configuration (tower geometry) and material. Briefly explain the design steps for transmission tower. **[6]**

Q5) a) List out the advantages of using tubular structures. **[5]**

b) A tubular column hinged at one end and roller at other end has the outside diameter of tube 150 mm and is of heavy gauge (i.e.@16.2 kg/m). The length of the column is 3.0m. Determine the safe load and column can carry if the column is of IS 1161 grade Yst 240 steel. **[5]**

Q6) a) List out the advantages and disadvantages of light-gauge sections. **[4]**

b) Design a simply supported beam using light-guage section carrying a udl of 4 kN/m (inclusive of self wt). Span of the beam is 4.5 m and consider it to be laterally supported. **[6]**

Q7) a) List out the various forces to be considered in the design of chimneys? **[4]**

b) Find the thickness of the self supporting lined chimney to the following particulars. **[6]**

Height of the chimney = 50 m

Diameter of the chimney = 3.0 m.

Thickness of the lining = 60 mm.

Wind Pressure = 1000 N/mm^2 on flat vertical surface.

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

Q8) Design a slab base with anchor bolts and the foundation for the column ISMB 300 subjected to an axial factored load of 800 kN and a factored bending moment @ its major axis of 20 kNm, The base plate rests on concrete of grade M25, and the bearing capacity of soil is 250kN/m^2. **[10]**

Total No. of Questions : 8] **SEAT No. :**

P4570 **[Total No. of Pages : 2**

[4860] - 1031

M.E. (Civil) (Structural Engg.) (Semester - I)

RESEARCH METHODOLOGY

(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Attempt any five questions from the following.***
2) ***Figures to the right indicate full marks.***

Q1) a) Explain the characteristics of research which uses scientific method. **[5]**

b) Write a note on "steps involved in publishing a research paper". **[5]**

Q2) a) Explain why research is important to decide a economic system of a country. **[5]**

b) How do you define research problem? Give one example to illustrate your answer. **[5]**

Q3) a) Write a note on advantages and limitations of sources of Literature survey. **[5]**

b) Explain the concept of experimental design & Explain Experiment design procedure steps. **[5]**

Q4) a) Explain the various sources of error in measurement. **[5]**

b) Explain why a good literature survey is important to narrow the research problem and the technique that might be used **[5]**

Q5) a) Explain Type I and Type II error in testing hypothesis. **[5]**

b) Write a note on 'Characteristics of Chi-Square test". **[5]**

P.T.O.

Q6) a) Enlist non-parametric tests for hypothesis testing and explain Wilcoxon Rank Sum Test. **[5]**

b) Distinguish between Parametric tests and Non-parametric tests for hypothesis testing. **[5]**

Q7) a) Discuss the important factors to be considered during presenting a research idea. **[5]**

b) Write a note on "Process for patenting a research idea". **[5]**

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

Total No. of Questions : 8]

SEAT No. :

P4416

[Total No. of Pages : 2

[4860] - 1032
M.E. (Civil - Structures)
FINITE ELEMENT ANALYSIS
(2013 Credit Course) (Semester - II)

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

Instructions to the candidates:

1) ***Answer any five questions from eight questions.***
2) ***Neat sketches must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of non-programmable calculator.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain principle of minimum potential energy. **[5]**

b) Explain physical significance of variational approach for analysis of beam. **[5]**

Q2) a) Explain the displacement model for 2D rectangular element using polynomial function. **[6]**

b) Explain use of pascals triangle in formulation of polynomial function. **[4]**

Q3) a) Explain & Derive stiffness vector for Constant strain triangle (CST). **[5]**

b) Write the convergence requirement regarding selection of element. **[5]**

Q4) a) Derive shape function using natural coordinates for one dimensional bar element. **[4]**

b) Derive stiffness matrix for truss element. **[6]**

Q5) A truss as shown in figure 1, is loaded at point C, with 20 kN force. The members AC, AB, CB are made of steel are of same cross-section. Write the global stiffness matrix for the truss. Hence write the Force displacement matrix. **[10]**

P.T.O.

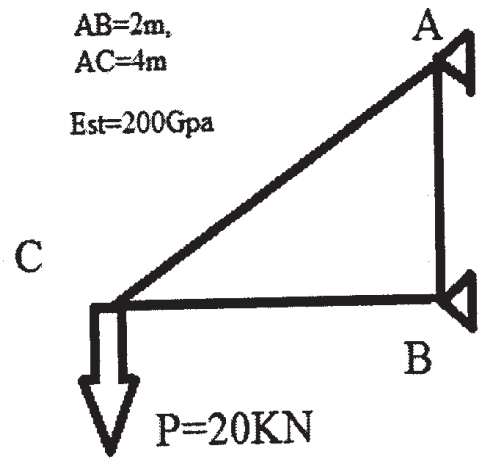

Fig 1

Q6) a) Explain Iso parametric elements. **[4]**

b) Explain ACM plate bending element. **[6]**

Q7) a) Sketch various 2D and 3D isoparametric elements, state its application with suitable engineering example. **[6]**

b) Draw elements for cylindrical shell with all structural details. **[4]**

Q8) a) Explain shape function for geometry for a typical curved shell element. **[5]**

b) Write the strain Displacement Matrix for the curved shell element. **[5]**

Total No. of Questions : 8] **SEAT No. :**

P4571 **[Total No. of Pages : 2**

[4860] - 1033

M.E. (Civil - Structures)

THEORY OF PLATES AND SHELLS

(2013 Credit Pattern)

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) Write assumption for the analysis of thin plate with small deflection. **[3]**

b) Derive an expression for maximum deflection using Naviers solutions when a load distributed on small area of simply supported square plate.**[7]**

Q2) a) State the steps involved in the Naviers solutions. **[3]**

b) Derive 4^{th} order differential equation for a thin plate in Cartesian coordinate with usual notation. **[7]**

Q3) a) Derive an expression for deflection by Levis method for simply supported on opposite edges and subjected to uniformly distributed load. **[7]**

b) Differentiate clearly difference between Navier's and Levy's solution in the analysis of rectangular plates. **[3]**

Q4) a) Starting from the basic principle, determine the internal forces and deflection of a circular plate loaded with uniformly distributed load if plate is fixed at the edges. **[6]**

b) Find transverse deflection w for the simply supported circular plate of radius a subjected to central point load P. **[4]**

P.T.O.

Q5) a) State and explain the assumption in the general theory of thin elastic shells. **[3]**

b) State and explain membrane theory and hence derive an equation of equilibrium. **[7]**

Q6) a) Using membrane theory, analyze a cylindrical open roof shell supported at the four corners for its dead weight only. **[8]**

b) State the merits and demerits of a shell structures against a plate structures. **[2]**

Q7) a) Derive equation of equilibrium for bending theory of cylindrical shells. **[7]**

b) Explain application of bending theory of shells to pressure vessels and pipes. **[3]**

Q8) a) Differentiate between membrane theory and bending theory for analysis of shells. **[6]**

b) Explain Beam theory of cylindrical shells with assumptions. **[4]**

Total No. of Questions : 8]

SEAT No. :

P4417

[Total No. of Pages :2

[4860]-1034

M.E. (Civil) (Structures)

ADVANCED DESIGN OF CONCRETE STRUCTURES

(2013 Credit Pattern) (Semester -II)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Answers should be written in same book.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IS 456, IS 1343, IS 1893, IS 3370 & non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data if necessary.***

Q1) a) Write short note with sketches on Characteristics of yield lines. **[4]**

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

i) Rectangular slab with fixed at supports on three sides with shorter side simply supported.

ii) Equilateral triangular slab fixed at two sides , unsupported at third side.

Q2) Design a RCC slab for a square hall of clear dimensions 5× 5m using Yield Line Theory. Assume the peripheral support thickness 300mm, the slab is simply supported. Use M25 Fe 500 take Live load = 4.5 kN/m^2 & floor finish load = 1.5 kN/m^2 . Draw details of reinforcement. **[10]**

Q3) Design a grid slab for a floor of hall 10.5 × 13.5 m c/c having square grid of 1.5m . Use M 20 Fe500 take Live load = 5 kN/m^2 & floor finish load = 1.5 kN/m^2. Apply the required check & draw reinforcement details. **[10]**

Q4) Design a flat slab for a hall with column spacing 6m ×6m c/c the size of the column diameter is 500mm each. Use M20 Fe500 take Live load = 4.5 kN/m^2 & floor finish load = 0.9 kN/m^2 . Draw details of reinforcement. **[10]**

P.T.O.

Q5) Design a staging for circular type ESR for 2.0 lakh liters with staging height 9m using M25, Fe500 in earthquake zone lll. Safe bearing capacity is 200kN/m^2.Design of Container is not required. Assume approx dimension of container, wall, top, bottom slab thickness, beams sizes & number of columns. Design must include calculations of vertical loads and horizontal force calculations. Design the bracings and columns . Draw the reinforcement details. **[10]**

Q6) Design a circular bunker to store 50 tonnes of coal for the following. Density of cement = 16 kN/m^2, Angle of repose = 29º. Use M25 & TMT steel. Draw the details of reinforcement in side wall and hopper. **[10]**

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

Centre to centre distance of column in both directions = 2.4m, Column size = 300 × 300mm, working axial load on each column = 600kN. The depth of the strata = 1.8m. Use M25 & Fe500. The safe bearing capacity of the strata = 90 kN/m^2. Show all Analysis and Design calculations & draw the reinforcement details.

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

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

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Total No. of Questions : 8]

SEAT No. :

P4418

[Total No. of Pages :2

[4860]-1035

M.E. (Civil) (Structures)

EARTHQUAKE ENGINEERING AND DISASTER MANAGEMENT

(601013) (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) ***Use of non programmable electronic calculator is allowed.***
5) ***Assume suitable data if necessary.***
6) ***Use of IS 1893 - 2002 (part- I) and IS 13920 - 1993 is permitted.***

Q1) a) What are the Natural and Man Made Disasters. Explain Volcanoes and Tsunami and Blast. **[5]**

b) Distinguish between Rayleigh waves and Love waves. **[5]**

Q2) Write a note on **[10]**

a) Effect of earthquake on structural elements.

b) Direct and Indirect effects of earthquake.

Q3) A four storied square RC framed building shown in Fig. 1 with live load 4 kN/m^2 is to be constructed in Surat. Work out seismic forces on the structure by seismic coefficient method using IS 1893. All beams and columns size 300 mm × 400 mm. Thickness of roof and floor slab 120 mm thick. Wall is of 150 mm thick all around. Height of each floor 3m. Density of concrete 25 kN/m^3. The c/c distance between two frames is 8m. **[10]**

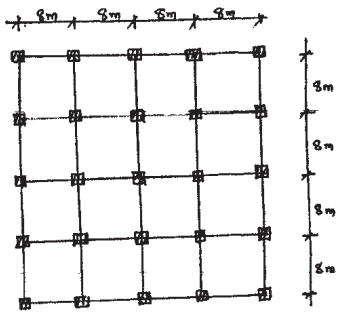

Fig. 1

P.T.O.

Q4) A plain concrete wall of dimensions 8m high , 6m long and 200mm thick is restrained against rotation at its base and unrestrained at the ends. If it has to carry a factored total gravity load of 200 kN and a factored horizontal load of 8 kN at top. Check the safety of the wall. Assume f_{ck} = 25, f_y = 500. in Mpa. **[10]**

Q5) a) Write a note on effect of blast loading on above ground structures. **[5]**

b) Define: **[5]**

i) Blast wind.

ii) Clearance Time.

iii) Drag Force.

iv) Ground Zero.

v) Side- on Overpressure.

Q6) Discuss the effect bomb blast loading and strong ground motion on structures. Compare their action and remedies. **[10]**

Q7) Write a note on any two: **[10]**

a) Fire loads and fire resistance Level.

b) Period of Structural Adequacy (PSA).

c) Methods of fire protection.

Q8) a) Explain the method of seismic base isolation. **[5]**

b) Explain the following methods of retrofitting of masonry walls (Any Two). **[5]**

i) Splint and bandage technique.

ii) Prestressing of masonry.

iii) Using FRP fabric.

☼ ☼ ☼

Total No. of Questions : 8] **SEAT No. :**

P4572 **[Total No. of Pages : 2**

[4860] - 1036

M.E. (Civil - Structures)

DESIGN OF R.C.C. AND PR. C.C. BRIDGES

(2013 Credit Pattern) (Semester - III)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***All answers should be written in same book.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IRC-5, 6,18,27,45,78,83 and 112 codes and I.S 1343-2012 and I.S.456-2000 is allowed.***
5) ***More reproduction of above codes as answer will not get any marks.***
6) ***Neat diagrams shall be drawn wherever necessary.***
7) ***Assume suitable data if necessary and clearly mention it while writing answer.***

Q1) a) Explain with neat sketch box Girder Bridge and skew bridge. **[5]**

b) Explain role of impact factor in design of Highway Bridge. **[5]**

Q2) a) Explain in brief Dynamic effect and Impact effect for the design of railway truss steel Bridges. **[5]**

b) Classify railway steel bridges according to load carrying capacity and floor location with their sketches. **[5]**

Q3) Design a slab culvert for a clear span 4.3 m. Suitable for single train of class AA loading the Clear roadway is 10 m. between the kerbs. Use safe stresses as per I.R.C. standards and use M 25& Fe500.Draw details of reinforcement. **[10]**

Q4) Design the Prestressed Concrete main girder for following data **[10]**

a) Effective Span-25 m

b) Clear width of road way-7.5 m

c) Foot path - 1 m on either side

P.T.O.

d) Wearing coat- 100mm thick
e) Spacing of cross girders-5m c/c
f) Live load - IRC Class AA tracked vehicle
g) Material-M40 for deck slab and M50 for girder with 12/7 cables (fy = 1500MPa)
h) End block design is not expected.
i) Draw details of section designed.

Q5) Design R.C.C Rigid Frame Bridge for the following data **[10]**

a) Clear span- 16m.
b) Road width-7.5 m between kerbs
c) Foot path 1.5 on each side.
d) Height-7.5m.
e) End condition-hinged.
f) Loading IRC AA or IRC A which gives maximum effect.
g) Coeff.of linear expansion of concrete---6.5x $\times 10^{-6}$
h) Ec = 25 KN/sq.mm use M 25 & Fe 500

Q6) a) Explain the various criteria for adoption of different types of expansion joints as per Ministry of surface transport. **[5]**

b) Explain with neat sketches various types of expansion joints used in bridges along with there limitations. **[5]**

Q7) Check the Stability of RCC Retaining wing wall of height 5 m which carries surcharge of 10 KN/Sq.m acting 2 m away from the wall the backfill material is having density 16 KN/Cu-m and angle of repose as 30 degrees the coeff.of friction as 0.45 Use M25 and Fe500. **[10]**

Q8) A pier of major fly over transmits a total load of 15000 KN at foundation level, design No. of precast R.C.C. piles and suitable pile cap using following data. **[10]**

a) Width of pier-1m.
b) Length of pier-9m.
c) Size of piles-400 × 400mm.
d) Spacing of piles-1.5m use M20 & Fe415
e) Hard strata available at depth -10 m below G.L. of bridge.

Total No. of Questions : 8]

SEAT No. :

P4573

[Total No. of Pages : 2

[4860] - 1037

M.E. (Civil) (Environmental Engineering)

ENVIRONMENTAL LEGISLATION AND MANAGEMENT SYSTEMS

(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) Discuss the functions and constitutions of SPCB and CPCB. **[10]**

Q2) Discuss the important features of Water (P & CP) Act 1974 & explain how consent to establish and consent to operate is granted under this Act. **[10]**

Q3) Discuss the power and functions of regulatory authority as per Air (P &CP) Act 1981. Explain under which section of this act, the consent to establish and consent to operate is granted. **[10]**

Q4) Discuss the salient features of Environmental (Protection) Act 1986 also explain the citing criteria for Industries. **[10]**

Q5) Discuss the principles and elements of EMP. **[10]**

P.T.O.

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

Q7) Discuss the Hazardous Waste, (Management and Handling) rules 1989 and Biomedical rules. **[10]**

Q8) Explain in detail the procedure of public hearing for stand alone projects for obtaining the Environmental clearance as per EIA notification. **[10]**

Total No. of Questions : 8]

SEAT No. :

P4419

[Total No. of Pages :1

[4860]-1038

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

ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY

(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 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 :

P4420

[Total No. of Pages : 2

[4860] - 1039

M.E. Civil (Environmental Engg.)

PHYSICO-CHEMICAL PROCESSES FOR WATER AND WASTE WATER TREATMENT

(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Attempt any five Questions.***
2) ***Figures to the right indicates full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) Enlist various types of Reactors used in waste water treatment. Explain any two reactors with neat sketches. **[10]**

Q2) A settling column analysis is run on a type I suspension. The settling column is 1.4 m high. Result analysis is given below: **[10]**

Settling time, min	12	30	45	60	90	180
Weight fraction remaining	0.95	0.80	0.60	0.45	0.25	0.05

What is the theoretical removal efficiency in a settling basin with a loading rate of 50 $m^3/m^2.d$?

Q3) What is the significance of settling velocity and surface over flow rate in sizing the treatment unit? Explain with suitable example how they can be used to determine the size of treatment units. **[10]**

Q4) If 1.0 MLD flow of domestic waste water with settled BOD_5 of 250 mg/l is treated in the conventional activated sludge plant reactor at 0.3 F/M ratios to obtain 85% BOD removal efficiency, estimate the net surplus sludge produced per day. (MLVSS= 0.8XMLSS, a = 0.6 and b = 0.06). **[10]**

P.T.O.

Q5) The cumulative flow of waste water reaching a treatment plant in a day varies as shown below. Determine the capacity of an equalization tank for the given flow variation. **[10]**

Time (hr.)	0	2	4	6	8	10	12	14	16	18	20	22	24
Cumulative flow (m^3)	0	25	50	75	100	120	130	140	150	160	170	198	225

Q6) Give a classification for trickling filter and distinguish between low and high rate trickling filter. Also explain the meaning of each term of NRC equation for Trickling Filter. **[10]**

Q7) Using Rankin's method, design a high rate trickling filter to treat 10 MLD flow of domestic wastewater having settled BOD of 200 mg/l. (concentration of desired effluent BOD = 30 mg/l, depth of filter media = 2.0 m and applied BOD to the filter is settled BOD). **[10]**

Q8) Explain various Factors affecting disinfection. Describe classification of disinfectants. Also highlight on Non Chemical Methods for Disinfection. **[10]**

Total No. of Questions : 8] SEAT No. :

P4574 [Total No. of Pages : 2

[4860]-1040

M.E. (Civil) (Environmental Engineering)

RESEARCH METHODOLOGY

(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) 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 are the criteria's for a good research. **[5]**

Q3) a) Write a short note on Need of pilot study. **[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]**

Q5) a) Write a short note on Chi-Square test as a non-parametric test of testing hypothesis. **[8]**

b) Enlist the Important Parametric tests for Hypothesis testing. **[2]**

P.T.O.

Q6) a) Explain the centroid method of factor analysis. **[5]**

b) Explain the conditions for the application of Chi-Square test. **[5]**

Q7) a) Discuss different types of reports. **[5]**

b) Explain the factors to be considered for effective presenting a research. **[5]**

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

Total No. of Questions : 8] SEAT No. :

P4575 [Total No. of Pages : 2

[4860]-1041
M.E. (Civil) (Environmental Engg.)
INDUSTRIAL WASTE WATER TREATMENT & MANAGEMENT
(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Attempt Any Five from the followings.***
2) ***Figures to the Right indicates full marks.***
3) ***Draw Neat figures whenever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Use of Scientific calculator is allowed.***

Q1) a) Write the typical characteristics of Industrial waste water. **[5]**

b) Discuss the Source reduction techniques for Industrial waste water. **[5]**

Q2) Discuss the Oil Seperation and Flotation techniques for Industrial waste water. **[10]**

Q3) a) Write a short note on Air Stripping for waste water treatment. **[5]**

b) Explain how will you remove the heavy metal like chromium from Industrial waste water. **[5]**

Q4) Write a Short Note on :

a) Wet Air oxidation for high COD Streams. **[5]**

b) Treatment of high TDS industrial waste water. **[5]**

Q5) Discuss the manufacturing Process and Sources of waste water from

a) Sugar Industries **[5]**

b) Distillery Industries **[5]**

P.T.O.

Q6) Discuss the treatment options and final treated effluent disposal methods for

a) Steel Industry **[5]**

b) Atomic Energy Plants **[5]**

Q7) a) Discuss how will you carryout the treatability studies for treating Industrial waste to CETP's. **[5]**

b) Discuss the general design consideration for CETP. **[5]**

Q8) Discuss the Sources of waste water generations from dye stuff industries and treatment options for the same. **[5 + 5 = 10]**

Total No. of Questions : 8]

SEAT No. :

P4251

[Total No. of Pages : 2

[4860]-1042

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

AIR POLLUTION AND CONTROL

(2013 Credit Pattern) (501067) (Semester - II)

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

Instructions to the candidates:

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

Q1) a) List the natural and anthropogenic sources of the following air pollutants : SO_2, NO_2, CH_4, CO, and particulate matters. **[5]**

b) Explain the effect of SO_2 and CO on human beings with specific concentration of gases. **[5]**

Q2) a) Illustrate and briefly describe effect of lapse rate on the plume behaviour. **[5]**

b) Determine the effective stack height using the following data: **[5]**

i) Physical stack is 200 m tall with 1 m inside diameter,

ii) Wind velocity is 3.5 m/s, air temperature is 17°C, and barometric pressure is 1000 millibars, and

iii) Stack gas velocity is 10 m/s, and stack gas temperature is 150°C.

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

b) A coal-fired power plant burns 10 tonnes of coal per hour and discharges the combustion products through a stack that has effective height of 100m. The coal has a sulfur content of 5%, and wind velocity at the top of the stack is 9 m/s. The atmospheric condition is slightly stable. Determine the maximum ground-level concentration of SO_2. **[5]**

P.T.O.

Q4) a) Write short note on basic principles/approaches used in air pollution control devices. **[5]**

b) Explain in short about control methods of Gaseous pollution. **[5]**

Q5) a) Explain methods of automobile air pollution control. **[5]**

b) Write a short note on selective catalytic reduction system for NOx control. **[5]**

Q6) a) Discuss in detail about the methods used for the sampling of gases and Particulates. **[5]**

b) Why do the national ambient air quality standard values of pollutants differ with respect to location and time-weighted average? **[5]**

Q7) a) Write short note on **[5]**

i) Evaporative Emissions.

ii) Air-Fuel Ratio.

b) Explain sources and control of odour. **[5]**

Q8) a) Explain indoor air cleaning system. **[5]**

b) Discuss briefly about indoor air pollutants and their sources. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4252

[Total No. of Pages :1

[4860]-1043

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

SOLID WASTE AND HAZARDOUS WASTE MANAGEMENT

(2013 Course) (Semester - II)

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

Instructions to the candidates:

1) ***Attempt any Five Questions.***
2) ***Figures to the right indicates full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) Discuss problems and issues associated with Solid waste management in our country. **[10]**

Q2) Discuss the composition of solid waste. Also differentiate between biodegradable and non-biodegradable solid wastes. **[10]**

Q3) Discuss the classification of transfer station for solid waste. **[10]**

Q4) What is Bio-Medical waste? Discuss the various methods for its collection and treatment? **[10]**

Q5) Discuss the precaution to be taken to avoid pollution during storage & transportation of Municipal Solid Waste? **[10]**

Q6) a) How do you decide where to put a landfill and what are the criteria for its location. **[5]**

b) Write note on TCLP test. **[5]**

Q7) What is composting? Why is composting important? How does composting works? **[10]**

Q8) For solid waste disposal site, the average speed data obtained is:

Distance X, Km/trip	10	20	30	40	50	60
Avg. Haul speed, Y, Km/hr.	25	28	38	50	58	65
Total time, hr.	0.4	0.65	0.75	0.78	0.85	0.95

Find the Haul speed constants “a” and “b” and the total time for site located at 38 Kilometer away. **[10]**

Total No. of Questions : 8] SEAT No. :

P4576 [Total No. of Pages : 2

[4860]-1044
M.E. (Civil) ((Environmental Engg.)
ENVIRONMENTAL SANITATION
(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) Which micro-organisms are responsible for communicable diseases? Explain any two methods of control of communicable diseases. **[4]**

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

Q2) a) "Food establishments must have an effective fly control program." Justify. **[4]**

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

Q3) a) Write a short note on: Bio-control method of fly breeding. **[4]**

b) Describe in detail methods adopted to control Plague. **[6]**

Q4) a) How will you achieve sanitation in case of Hospitals? Explain. **[4]**

b) Explain the factors affecting Industrial sanitation. **[6]**

Q5) a) What do you understand by Low cost excreta disposal system? **[4]**

b) How to control dust pollution in sugar industry? Explain. **[6]**

P.T.O.

Q6) a) Write a short note on Rural sanitation improvement schemes. **[4]**

b) Write a short note on water connection in building. **[6]**

Q7) a) Write a short note on principles governing design of building drainage. **[4]**

b) Explain Single Stack System with sketch. **[6]**

Q8) a) Explain Intercepting Traps with a neat sketch. **[4]**

b) What do you understand by dry weather flow? Discuss in brief various factors affecting the dry weather flow. **[6]**

Total No. of Questions : 8]

SEAT No. :

P4659

[Total No. of Pages : 2

[4860]-1045

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

ENVIRONMENTAL IMPACT ASSESSMENT

(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) Explain the various stages of EIA. Also states the important provisions in EIA notifications of Govt. of India. **[10]**

Q2) Discuss the various methods for Impact Assessment. **[10]**

Q3) Explain how would you predict and assess the environmental Impact due to air and noise on surroundings due to the proposed activity. **[10]**

Q4) Discuss the prediction and assessment of Impact for ground water and soil and states the mitigation measures for the same. **[10]**

Q5) Explain how will you collect the Basic information on Socioeconomic environment? Discuss the mitigation measures for resettlement & rehabilitation. **[10]**

Q6) Discuss the role of Public Participation in Environmental decision making. Explain the various techniques for conflict management & dispute resolution. **[10]**

P.T.O.

Q7) Explain the general structure of EIA report. Discuss about EMP and Post Environmental monitoring. **[10]**

Q8) Explain in detail the procedure for obtaining the Environmental clearance for construction projects. **[10]**

Total No. of Questions : 8] **SEAT No. :**

P4577 **[Total No. of Pages : 2**

[4860]-1046
M.E. (Civil) (WREE)
PLANNING & MANAGEMENT OF WATER RESOURCES
(2013 Credit Pattern)

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) Write the objectives and social goals of water resources planning and management. **[4]**

b) Elaborate the non reversibility constraint in the water resources planning and management. **[6]**

Q2) a) Write the five feasibility tests for any water resources project. **[5]**

b) Explain any 'Single- Source Multipurpose Water Resource System' with suitable example. **[5]**

Q3) a) Write a note on trap efficiency. **[4]**

b) Define Reliability of a water resource system. Explain any one method of Reliability analysis. **[6]**

Q4) a) Explain in detail how the conjunctive use of surface and ground water affects on the planning and management of water resources. **[5]**

b) What is the equivalent present worth about 10% interest of 3 investments of Rs. 60,00,000 one made now. One made about end of third year and one made last at the end of 10^{th} year from now. **[5]**

P.T.O.

Q5) a) Enlist the characteristics and functions of a reservoir which is specifically constructed for water supply systems. **[6]**

b) How the Demand for drinking water and for navigational purposes is decided? Comment on the current status of these demands of your state? **[4]**

Q6) a) Write a note on Resilience for post-disaster response and recovery. **[5]**

b) Enlist different uncertainties in water resources systems and explain any one in detail. **[5]**

Q7) a) Write a note on 'Ground water evaluation'. **[4]**

b) Estimate the six types of benefits for different purposes in cost benefit analysis of water resources. **[6]**

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

b) In a lift irrigation project a choice is to be made between two pumps, with details given in the following table. Which of these two pumps is economically superior At an interest rate of 8 %? Use Present Worth Method and take period of analysis as 30 years. **[6]**

Pump	Capital Cost	Annual Cost	Annual Benefit	Life	Salvage Value
(1)	(2)	(3)	(4)	(5)	(6)
A	40,000	6,000	15,000	10	6,000
B	60,000	5,000	16,000	15	8,000

Total No. of Questions : 8]

SEAT No. :

P4253

[Total No. of Pages :1

[4860]-1047

M.E. (Civil) (Water Resource and Environmental Engg.)
ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY
(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Attempt any Five Questions.***
2) ***Figure to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) Differentiate between organic and inorganic compounds by considering various factors. Also comment on interaction of water with organic and inorganic species from the environment. **[10]**

Q2) Mention various Physico chemical parameters. What are the techniques for estimation of various elements at major, minor, trace and ultra-trace level concentration? Mention merits and demerits of these techniques. **[10]**

Q3) Discuss physical and chemical properties of lead and its compounds. Also highlight on Aflatoxin occurrence, chemical composition and properties of metabolism, acute toxicity and carcinogenicity of these compounds. **[10]**

Q4) Conscript various enzymes and elucidate their role in the field of environmental microbiology. **[10]**

Q5) Discuss in detail classification and characteristics of bacteria. Also describe cultural techniques. **[10]**

Q6) Write notes on: **[10]**

a) Gene Transfer & Recombinant DNA Technology.

b) Cell Morphology.

Q7) Discuss types and metabolic classification of microorganism. Also highlight on microbial metabolism. **[10]**

Q8) Explain Electro analytical techniques EEM-608 and GCMS technique for pollutant analysis. **[10]**

Total No. of Questions : 8] SEAT No. :

P4578 [Total No. of Pages : 2

[4860]-1048

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

FLUID MECHANICS

(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) Derive Euler's equation of motion. **[5]**

b) Define nominal thickness, momentum thickness, displacement thickness, energy thickness of boundary layer and laminar sublayer. **[5]**

Q2) a) Bernoulli's theorem is based on which principle? Give its statement. Name three devices where Bernoulli's equation is applied. **[4]**

b) The velocity distribution in the turbulent boundary layer over a flat plate is given as $\frac{u}{U_\infty} = 2\frac{y}{\delta} - \frac{1}{2}\left(\frac{y}{\delta}\right)^2$. Obtain an expression for the displacement thickness, momentum thickness and energy thickness. **[6]**

Q3) a) Derive differential form of continuity equation in cylindrical polar coordinate system. **[5]**

b) Water flows between two horizontal plates kept 4 m apart. The lower plate is stationary while the upper plate moves with a velocity of 0.5 m/s to the right. Find the pressure gradient such that the flow rate is zero. Viscosity of water 20°C is 0.001 N-s/m^2. **[5]**

Q4) a) Derive equation for stream function and velocity potential for superposition of a source and a sink. Draw stream lines and potential lines. **[5]**

b) Derive equation for velocity distribution for laminar flow between a circular pipe starting with Navier-Stokes equations. **[5]**

P.T.O.

Q5) a) What is boundary layer separation? What are its effects and how to control it? **[5]**

b) What are types of turbulent flow? Explain in detail with the help of sketches. **[5]**

Q6) a) Derive boundary layer equations starting with Navier-Stoke equations. **[6]**

b) Write a short note on Reynolds rules of averages. **[4]**

Q7) a) Derive equation for stagnation density. **[5]**

b) Discuss the analogy between the normal shock wave and the hydraulic jump. **[5]**

Q8) a) Derive equation for celerity of elastic wave due to compression of fluid. **[5]**

b) What is the effect of compressibility on drag. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4579

[Total No. of Pages : 2

[4860]-1049
M.E. (Civil) (WREE)
RESEARCH METHODOLOGY
(2013 Credit Pattern)

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

Instructions to the candidates:

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

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

b) Distinguish between Research methods and Research methodology **[5]**

Q2) a) Discuss the need for writing a research proposal for a funding agency. **[5]**

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

Q3) a) Write a note on Brain Storming and Delphi method. **[5]**

b) Explain in brief various sampling techniques. **[5]**

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

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

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

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

P.T.O.

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

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

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

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

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

Total No. of Questions : 8]

SEAT No. :

P4254

[Total No. of Pages : 2

[4860]-1050

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

ENVIRONMENTAL HYDRAULICS AND ENVIRONMENTAL STRUCTURES

(2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Use of electronic pocket calculator, logarithmic table, slide rule, mollier charts and steam table is allowed.***
5) ***Use IS Code 456 and IS Code - 1893 - (Part - I) - 2002.***

Q1) a) Explain the working of wind pump with figure. **[4]**

b) Axial flow compressor is design 55% reaction with inlet and outlet angle for rotor blade is 81^{o} and 45^{o} measured axially. The mean speed of blade is 375 m/s and axial velocity of flow is constant throughout. Assume W.F. = 0.9 Determine the number of stage if pressure ratio is 8 : 1 with isentropic efficiency 82%. The stagnation inlet temperature is 450 K Take Gama = 1.3, R = 286 NM/kg ^{o}K Cp = 1.004 kJ/kg ^{o}K. **[6]**

Q2) a) Compare the performance of centrifugal compressor. **[4]**

b) A pump supplies oil at 200 lit/min to 50mm diameter double acting cylinder. the rod diameter is 20 mm and the load acting on the cylinder during extension and retraction is 8 kN. Find the hydraulic pressure, piston velocity and the cylinder power during extension and retraction store.**[6]**

Q3) a) Explain the working of LVDT. **[4]**

b) Explain working of thermocouple and working of RTD with figure. **[6]**

Q4) A four story RCC Frame structure is use for carrying pipe line in plant situated in Zone IV. The height of each floor is 3.5 meter and total height of RCC structure is 14 meter. The dead load and live load on each floor are as follows, On First Floor = 3500 kN, On Second Floor = 3400 kN, On Third Floor = 3400kN, On Fourth Floor = 2500 kN respectively. The soil below foundation is assumed to be hard rock. Find out total base shear as per IS Code - 1893 - (Part - I) - 2002. **[10]**

P.T.O.

Q5) Determine EBCT, Mass of GAC, Volume of water to treated for the following data, Volume of GAC used = 20 cum. Meter, Volumetric flow rate = 1600 lit/ min., Initial and final concentration of pollutant is 8 mg/ lit and 0.07 mg/lit. Freundlich Capacity Factor = 24(mg/gm) (Lit/mg)1/n, and intensity parameter n = 0.8. **[10]**

Q6) a) A closed vessel is to be design to withstand internal pressure of 65 MPa having inside diameter of 500mm Following properties may be assumed Yield Strength = 300 MPa, 'Ultimate Tensile strength = 510 MPa, Poission ratio = 0.4, Estimate wall thickness on the basis of, **[5]**

i) Maximum Principle Stress Theory

ii) Maximum Shear Stress Theory

b) An air receiver of a cylindrical portion of 2.5 meter length and 1.3 meter in diameter. It is closed by hemispherical ends. The pressure is not exceeding 4 N/mm^2. If the material is stress having yield point 270 N/mm^2 and if factor of safety is 2.5 used. Find the required thickness of the cylinder and thickness of hemispherical shape cylinder, assume joint efficiency for both cylinder is 0.8. **[5]**

Q7) a) Determine only forces acting on a circular water tank for following data Height of tank is 5 meter, Capacity of tank 4000 cum meter, grade of concrete and steel is M20 and Fe 250. Take axial and compressible stress in concrete as 1.2 MPa and 7 MPa. Use IS code 456. **[5]**

b) Determine area and depth of foundation of square column carrying load of 1200 kN vertical. The SBC of soil is 110 kN/M^2, density of soil is 25 kN/ m^3, angle of repose = 32^o. **[5]**

Q8) A pressure vessel consist of a cylindrical shell of inside diameter 1600 mm. Which is closed by torispherical head with a crown radius of 1200 mm. The operating pressure inside the cylinder is 4 MPa. The yield strength of the material is 320 MPa. The corrosion allowance is 2.5 mm and weld efficiency is 82%. Determine the thickness of cylindrical shell and the torispherical head.**[10]**

Total No. of Questions : 8]

SEAT No. :

P4580

[Total No. of Pages : 2

[4860]-1051

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

HYDROLOGY

(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) Write a note on hydrologic cycle **[4]**

b) Describe with the neat sketch any three methods of separation of base flow from the hydrograph of runoff (stream flow hydrograph) indicating the situation under which you advocate them. **[6]**

Q2) a) The runoff of a stream in the month of September has a mean and standard deviation of 265 and 200 cumec- months. Assuming that log normal distribution is a good fit, find the probability that September runoff in this stream in any year exceeds 350 cumec- months. What is the probability that the September runoff would fall in the range 150 to 350 cumec-months? **[5]**

b) Write a note on selection of distribution function and estimation of parameters. **[5]**

Q3) a) Explain the method of design flood estimation using the rational method. **[4]**

b) The analysis of 30 year flood data at a point on a river yielded $x = 1200\ m^3/s$, and $s_x = 650\ m^3/s$ .For what discharge would you design the structure at this point to provide 95% assurance that the structure would not fail in the next 50 years? Use Gumbel's method. **[6]**

P.T.O.

Q4) a) Explain how the yield of an open well can be determined using recuperation test. **[5]**

b) Define the terms: (i) Aquifuge, (ii) Aquiclude, (iii) Aquitard (iv) confined aquifer (v) perched groundwater. **[5]**

Q5) a) A 20 cm well penetrates 30 m below static water level (GWT).After a long period of pumping at a rate of l800lpm, the draw downs in the observation wells at 12m and 36 m from the pumped well are 1.2 m and 0.5 m, respectively. Determine (i) Transmissibility (ii) the drawdown in the pumped well assuming R=300 m, (iii)specific capacity of the well.**[5]**

b) What are the advantages of ground water compared to surface water?**[5]**

Q6) a) What are the analog models? Explain any two models. **[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) Distinguish between: (i) Maximum probable flood and design flood, (ii) Return period and exceedence probability. **[6]**

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

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Total No. of Questions : 8]

SEAT No. :

P4581

[Total No. of Pages : 2

[4860]-1052

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

OPEN CHANNEL HYDRAULICS

(2013 Credit 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, electronics pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Show that maximum velocity in a circular channel happens when y/D=0.8 1. **[6]**

b) Explain the characteristics of M_1 profile and state one example of its occurrence. **[4]**

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

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

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

b) A triangular channel has a side slope of 1:1 and longitudinal slope of 1/1000. Determine whether the channel is mild, steep or critical when discharge of $0.25 m^3/s$ flows through it. Take Manning's n = 0.0 15. Also state for which range of depths the flow will be in Zone 1, Zone 2 and Zone3. **[6]**

P.T.O.

Q4) a) State applications of hydraulic jump. **[2]**

b) A rectangular channel 20 m wide flow with normal depth of 2 m with a slope of bed 1 in 6400. At a certain section, the flow depth is 3 m. How far upstream or downstream of this section will the depth be 2.6 m. Use step method and take only two steps. Take Manning's coefficient = 0.015. Sketch and mention the profile. **[8]**

Q5) a) Derive De Marchi equation for side weir. **[6]**

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

Q6) a) Classify the SVF profiles. **[4]**

b) Derive dynamic equation of uniformly progressive wave. **[6]**

Q7) a) Write in brief about alluvial channel bed forms. **[4]**

b) Discuss the development of Muskingum method of flood routing stating the equations and algorithm. **[6]**

Q8) a) Derive Rouse equation for suspended bed load. **[6]**

b) Explain method of characteristics for flood routing. **[4]**

Total No. of Questions : 8]

SEAT No. :

P4582

[Total No. of Pages : 2

[4860]-1053

M.E. (CIVIL) (Water Resource & Environmental Engg.)

ADVANCED WATER & WASTEWATER TREATMENT

(2013 Credit Pattern) (Semester - III)

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

Instructions to the candidates:

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

Q1) Explain in detail the principle and working of electro dialysis and ion exchange for water and wastewater treatment. **[10]**

Q2) Discuss the principle, concept and necessity of aeration. Explain various methods of aeration with neat sketches. **[10]**

Q3) What is the theory of disinfection? State the factors affecting disinfection. Explain break point chlorination. **[10]**

Q4) Design an aerated grit chamber for the treatment of municipal wastewater. The average flow rate is 0.5 m^3/s. Take peak factor as 2.75. **[10]**

Q5) Design an activated sludge process for municipal wastewater flow rate of 8000m^3/day, BOD of settled effluent = 180 mg/l, expected BOD of treated effluent = 10 mg/l, yield coefficient=0.5 kg/kg, K_d = 0.05/day, MLSS =3000 mg/l, return sludge solids concentration = 10,000 mg/l and mean cell residence time is 10 days.

Determine

a) Volume of reactor
b) F/M ratio
c) VLR
d) Oxygen requirement
e) Recycle ratio &
f) BOD removal efficiency. **[10]**

P.T.O.

Q6) Design a high rate trickling filter using NRC equations for

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. **[10]**

Q7) State the design parameters, principle, advantages and disadvantages of UASBR. Draw a neat sketch of the reactor. **[10]**

Q8) State the sources of wastewater from manufacturing process, characteristics of effluent for dairy and automobile industry. Draw the treatment flow charts. **[10]**

Total No. of Questions : 8]

SEAT No. :

P4583

[Total No. of Pages : 2

[4860]-1054
M.E. (CIVIL) (WREE)
DAM ENGINEERING
(2013 Credit 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) Enumerate various forces acting on a gravity dam. Explain your answer with typical sketch of a gravity dam. **[4]**

b) Explain various foundation treatments in gravity dams. **[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 the concepts of trail load 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) State various types of spillways and explain any two **[6]**

b) Calculate the discharge over an Ogee weir with coefficient of discharge equal to 2.4 at a head of 2 m. The length of spillway is 100 m. The weir crest is 8 m above the bottom of approach channel having same width as that of the spillway. **[4]**

P.T.O.

Q6) a) Write a note on Dam Safety Organization (DSO) **[6]**

b) State various instruments used to assess safety of dam **[4]**

Q7) a) State various organizations in the world related to Dam engineering with their common objectives. **[4]**

b) Explain functioning of Global Water Partnership (GWP). **[6]**

Q8) a) What are the provisions to take care of project affected people? **[6]**

b) What is the impact on environment due to construction of dam? **[4]**

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Total No. of Questions : 8]

SEAT No. :

P4255

[Total No. of Pages : 3

[4860]-1055

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

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

Instructions to the candidates:

1) ***Answer any Five questions out of eight questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to 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) Find the root of **[5]**

$Y = 3x + \sin x - e^x$

using Newton - Raphson method.

Carry out five iterations.

b) Fit a straight line for the following data **[5]**

x	10	15	20	25	40	50	55
y	5	21	19	37	42	54	70

Derive the equation you use.

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

$4x_1 - x_2 - x_3 = 150$

$-2x_1 + 4x_2 = 120$

$-2x_1 + 4x_3 = 210$

b) Find the interpolating Polynomial for the data: **[5]**

x	0	1	2	5
y	2	3	12	147

Find the value of Y at X = 1.5 using Lagrange's Interpolation.

P.T.O.

Q3) a) The following table describes the parameters associated with a thermodynamic problem. **[5]**

x_i	:	–1	0	1
$f(x_i)$	:	0	1	1
$f'(x_i)$	:	1	3	7

Estimate values of f(–0.5) and f(0.5) using Hermite interpolation.

b) The temperature of a metal rod was measured at various time interval during heating and the values are given in the table below: **[5]**

Time t(mts)	:	0.5	1.5	3.0	5.0	6.5	8.0
Temp(T = f(t) (^oC))	:	1.625	5.875	31	131	282.125	521

Find interpolating polynomial using Newton's divided difference interpolation.

Q4) a) Evaluate $\int_0^4 \left(x^3 - \cos x + 6\right) dx$ using Gauss- Legendre - 3 point formula. **[5]**

b) Employ power method to determine largest eigen value for the following set of equations **[5]**

$x_1 - 3x_2 + 2x_3 = \lambda x_1$, $\quad 4x_1 + 4x_2 - x_3 = \lambda x_2$,

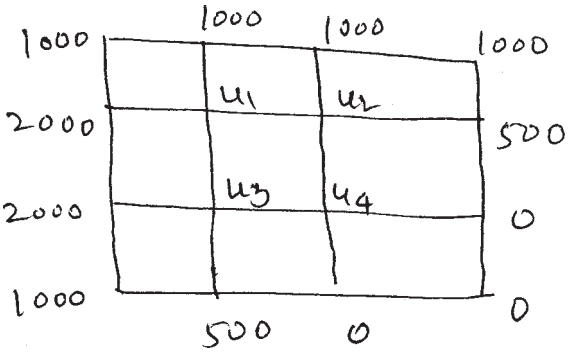
$6x_1 + 3x_2 + 5x_3 = \lambda x_3$.

Q5) a) Use Householder's method to reduce the following matrix A to its tridiagonal form $A = \begin{bmatrix} 1 & 3 & 4 \\ 3 & 2 & -1 \\ 4 & -1 & 1 \end{bmatrix}$. **[5]**

b) Using Runge - Kutta method of fourth order to solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with conditions $y(0) = 1$, at $x = 0.2, 0.4$. **[5]**

Q6) a) Write short note on shooting method with suitable examples. **[5]**

b) Given the values of u(x,y) on the boundary of the square in the following figure: **[5]**



Evaluate the function u(x,y) satisfying Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the pivotal points of this figure using Gauss - Seidel method.

Q7) a) Solve the system of equations **[5]**

$$27x_1 + 6x_2 - x_3 = 85$$
$$6x_1 + 15x_2 + 2x_3 = 72$$
$$x_1 + x_2 + 54x_3 = 110$$

using Gauss - Seidel iteration method (use four iterations).

b) Explain the Crank-Nicolson's implicit finite scheme for one-dimensional heat equation $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$, Discuss stability criterion for the same. **[5]**

Q8) a) Use Heun's method to integrate $y' = 4e^{0.8x} - 0.5y$ from $x = 0$ to $x = 4$ with a step size of '1'. **[5]**

The initial condition at $x = 0$, is $y = 2$.

Also estimate the error.

b) Find the solution of initial boundary value problem $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$, $0 \le x \le 1$, subject to the initial conditions $u(x, 0) = \sin \pi x$ $(0 \le x \le 1)$. **[5]**

$\left(\frac{\partial u}{\partial x}\right)(x,0) = 0, 0 \le x \le 1$, and the boundary conditions $u(0,t) = 0$, $u(1,t) = 0$, $t > 0$ by using explicit scheme.

Total No. of Questions : 8]

SEAT No. :

P4256

[Total No. of Pages : 4

[4860]-1056

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

ADVANCED THERMODYNAMICS & COMBUSTION TECHNOLOGY

(2013 Credit Pattern) (Semester - I) (502102)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Use of scientific calculator, steam tables and Mollier charts is allowed.***
4) ***Figures to the right indicate full marks.***

Q1) a) Develop the following formula of Vander Waal's equation in terms of reduced parameters. **[4]**

$$\left(P_r + \frac{3}{v_r^2}\right)(3v_r - 1) = 8T_r$$

b) Find the specific volume of air stored at 60 bar and at temperature of 40 deg. C by using. **[6]**

i) Perfect gas equation

ii) Vander Wall's equation of state

iii) Generalized compressibility chart.

For air a = 136.1 Kpa $(m^3/kg\text{-}mole)^2$

b = 0.0385 $(m^3/kg\text{-}mole)$.

Q2) a) Define critical state of a substance? Explain the terms critical pressure, critical temperature and critical volume of water. **[4]**

b) Steam initially at 0.3 MPa, 250 deg. C is cooled at constant volume. At what temperature will the steam become saturated vapour? What is the quality at 80 deg. C? What is the heat transferred per kg of steam in cooling from 250 deg. C to 80 deg. C. **[6]**

Q3) a) Why is the entropy increase of an isolated system a measure of extent of irreversibility of the process undergone by the system? **[4]**

b) In a steam generator, water is evaporated at 260 deg. C, while the combustion gas (cp = 1.08 kJ/kg K) is cooled from 1300 deg. C to 320 deg. C. The surroundings are at 30 deg. C. Determine the loss in available energy due to the above heat transfer per kg of water evaporated (Latent heat of vaporization of water at 260 deg. C = 1662.5 kJ/kg). **[6]**

Q4) a) Explain the decrease of Exergy principle with suitable example. **[4]**

b) A block of iron weighing 100 kg and having a temperature of 100 deg. C is immersed in 50 kg of water at a temperature of 20 deg. C What will be the change of entropy of the combined system of iron and water? Specific heats of iron and water are 0.45 and 4.18 kJ/kg K respectively. **[6]**

Q5) a) Write a note on Clausius-Clapeyron equation. **[4]**

b) Derive the first and second TdS equations using Maxwell relations. **[6]**

Q6) a) Explain enthalpy of formation and enthalpy of combustion. **[4]**

b) Explain **[6]**

i) Dalton's law of partial pressure

ii) Amagat's law of additive volume

Q7) a) What is adiabatic flame temperature? **[4]**

b) The product of combustion of a unknown hydrocarbon CxHy have the following composition as measured by an Orsat apparatus: CO_2 8%, CO 0.9%, O_2 8.8% and N_2 82.3%. Determine: **[6]**

i) the composition of the fuel.

ii) the air fuel ratio.

iii) the percentage of excess air used.

Q8) a) Write a note on: **[6]**

i) Thermodynamics of Nutrition and exercise

ii) Criterion for chemical equilibrium.

b) Define : **[4]**

i) The mass fraction of component

ii) the mole fraction of component

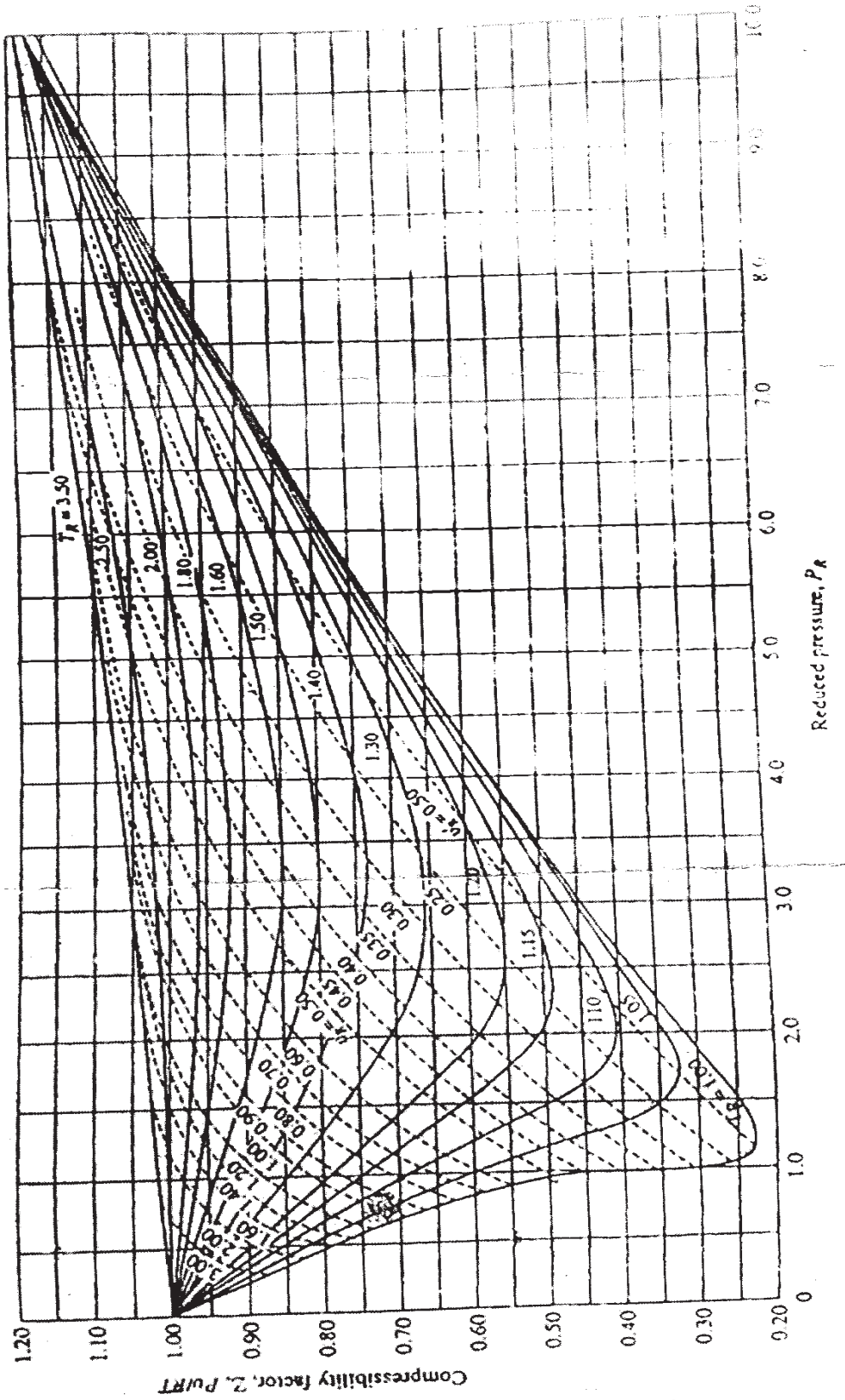


Fig. Compressibility Chart [Q1.b]

Total No. of Questions : 7]

SEAT No. :

P4257

[Total No. of Pages : 2

[4860]-1057

M.E. (Mechanical-Energy Engineering)

ADVANCED FLUID MECHANICS

(2013 Credit Pattern) (Semester - I) (502103)

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

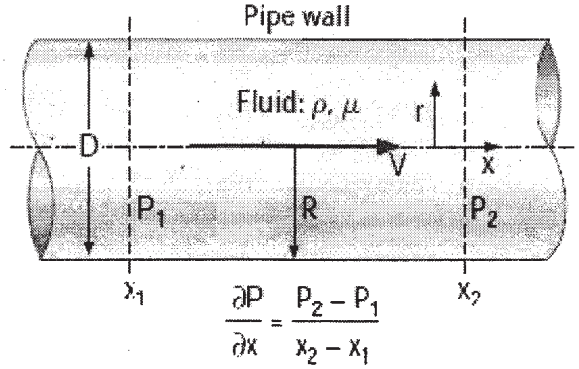
Instructions to the candidates:

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 an expression for conservation of mass and momentum using integral analysis. **[5]**

b) Derive frictionless Bernoulli equation using principle of conservation of energy. **[5]**

Q2) a) Obtain exact solution of fully developed for the pipe shown in the figure. **[5]**



b) Deduce Bernoulli equation from Navier Stoke equation. **[5]**

Q3) a) Obtain equations for streamlines and velocity potential lines for source and sink flow. **[5]**

b) Explain Magnus effect and derive expression for lift on rotating cylinder in uniform flow by using Kutta Joukowsky theorem. **[5]**

P.T.O.

Q4) a) State Boundary layer assumptions and obtain boundary layer equation in nondimensionalised form. **[5]**

b) Obtain momentum integral equation for the boundary layer. **[5]**

Q5) Derive an expression for Navier Stokes equation for turbulent flow. **[10]**

Q6) a) Derive equation for speed of sound and determine

i) the speed of sound and

ii) the Mach number at the diffuser inlet when the air temperature is $30^{o}C$ if the air enters a diffuser with a velocity of 200m/s. **[5]**

b) Develop area velocity relationship in terms of Mach number and discuss effect of variation of area for subsonic, sonic, and supersonic flows.**[5]**

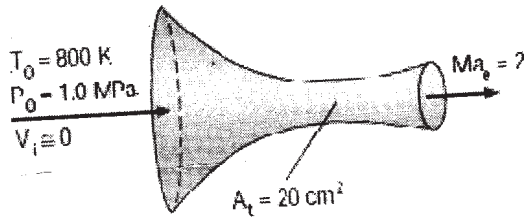
Q7) a) Obtain continuity equation in cylindrical coordinate system. **[5]**

b) Air enters a converging - diverging nozzle, shown in Fig. 12-28, at 1.0 MPa and 800 K with a negligible velocity. The flow is steady, one-dimensional, and isentropic with k = 1.4. For an exit Mach number of Ma = 2 and a throat area of 20 cm^2, determine **[5]**

i) the throat conditions,

ii) the exit plane conditions, including the exit area, and

iii) the mass flow rate through the nozzle.



Total No. of Questions : 8]

SEAT No. :

P4258

[Total No. of Pages : 2

[4860]-1058

M.E. Mechanical (Heat Power / Design / Mechatronics/CAD/CAM/ Energy Engineering)

RESEARCH METHODOLOGY

(2013 Credit Pattern) (Semester - I) (502104)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams should be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of pocket calculators & different gas charts applicable is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) State the different Criteria for Good research. **[5]**

b) What are the different types of research based on application point of view. **[5]**

Q2) a) What is the significance of Hypothesis in Research. **[5]**

b) Explain the importance of literature survey during various stages of conducting research viz. **[5]**

i) Defining the research problem,

ii) Carrying out research work,

iii) Concluding research problem,

iv) Report writing.

Q3) a) Explain the static and dynamic characteristics of Instruments with suitable examples. **[5]**

b) What is the role of DSP in data collection in noisy environment. **[5]**

Q4) What is the difference between error and uncertainty during measurements. What are the different sources of errors during measurement. State good measurement practices. What is the role of calibration of instrumentation in research process. **[10]**

P.T.O.

Q5) a) Explain the significance of research design. **[5]**

b) Explain with suitable examples Non-linear analysis. **[5]**

Q6) a) Write note on steady and unsteady state mathematical model for any research problem of your choice. **[5]**

b) Why a strong mathematical model is necessary to carry out quality research? **[5]**

Q7) a) A sample of 400 students found to have a mean height of 67.47 inches. Can it be regarded as sample from large population with mean height 67.39 inches and standard deviation of 1.3 inches. Test at 5% level of significance. Z critical from Z - test table = 1.645. **[5]**

b) Explain the structure for writing a research report. **[5]**

Q8) Explain format of a Research Proposal clearly stating the sections to be included while writing a good research proposal. What are the different Government and Non-Government funding agencies which support the engineering research. **[10]**

Total No. of Questions : 7]

P4584

SEAT No. :

[Total No. of Pages : 2

[4860] - 1059

M.E. (Mechanical -Heat Power)

ADVANCED HEAT TRANSFER

(2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Answer five questions from following.***
2) ***Draw Diagrams wherever necessary.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data wherever necessary.***

Q1) a) Explain Various Boundary and Initial Conditions. **[5]**

b) The coating on a plate is cured by exposure to an infrared lamp providing a uniform irradiation of 2000W/m^2. It absorbs 80% of the irradiation and has an emissivity of 0.50. It is also exposed to an air flow and large surroundings, for which temperatures are 20°C and 30°C, respectively. If the convection coefficient between the plate and the ambient air is 15W/m^2 K, what is the cure temperature of the plate? **[5]**

Q2) a) Explain lumped system analysis and its criteria. Explain dimensional numbers associated with transient conduction. **[5]**

b) In a production facility, 3-cm-thick large brass plates (k = 110 W/m°C, ρ = 8530 kg/m^3, C_p = 380 J/kg°C, and α = 33.9 x 10^{-6} m^2/s) that are initially at a uniform temperature of 25°C are heated by passing them through an oven maintained at 700°C. The plates remain in the oven for a period of 10 min. Taking the convection heat transfer coefficient to be h= 80 W/m^2°C, determine the surface temperature of the plates when they come out of the oven. Take λ_1 = 0.1039, A_1 = 1.0038. **[5]**

Q3) a) Derive convection equation in differential form. **[5]**

b) The electrically heated 0.6-m-high and 1.8-m-long windshield of a car is subjected to parallel winds at 1 atm, 0°C, and 80 km/h. The electric power consumption is observed to be 50 W when the exposed surface temperature of the windshield is 4°C. Disregarding radiation and heat transfer from the inner surface and using the momentum-heat transfer analogy, determine drag force the wind exerts on the windshield. (Take ρ_a = 1.29kg/m^3, C_p = 1.006 kj/kgk, P_r = 0.7362. **[5]**

P.T.O.

Q4) a) Prove that for laminar flow through pipe under constant surface heat flux condition, Nu = 4.36. **[5]**

b) The components of an electronic system dissipating 90 W are located in a 1-m long horizontal duct whose cross section is 16 cm x 16 cm. The components in the duct are cooled by forced air, which enters at 32°C at a rate of 0.65 m3/min. Assuming 85 percent of the heat generated inside is transferred to air flowing through the duct and the remaining 15 percent is lost through the outer surfaces of the duct, determine (a) the exit temperature of air and (b) the highest component surface temperature in the duct. (ρ = 1.146 kg/m^3, k = 0.02625w/mk, v = 1.654 × 10^{-4} m^2/s c_p = 1.0075 /kgk p_r = 0.7268. **[5]**

Q5) a) Explain physical mechanism for natural convection along with governing equation. **[5]**

b) A 12-cm-high and 20-cm-wide circuit board houses 100 closely spaced logic chips on its surface, each dissipating 0.05W. The board is cooled by a fan that blows air over the hot surface of the board at 35°C at a velocity of 0.5 m/s,. The heat transfer from the back surface of the board is negligible. Determine the average temperature on the surface of the circuit board assuming the air flows vertically upwards along the 12- cm-long side by (a) ignoring natural convection and (b) considering the contribution of natural convection. Disregard any heat tranfer by radiation. K = 0.02717 w/mk, v = 1.774 × 10^{-4} m^2/s, p_r = 0.7235. **[5]**

Q6) a) Explain different modes of pool boiling curve. **[5]**

b) Derive an expression for heat transfer coefficient for laminar film condensation over vertical flat plate. **[5]**

Q7) a) Discuss various "View Factor Relations" **[5]**

b) The inner and outer surfaces of a 25 cm thick wall in summer are at 27°C and 44°C, respectively. The outer surfaces of the wall exchanges heat by radiation with surrounding surface at 40°C, and convection with ambient air also at 40°C with a convection heat transfer coefficient of 8 W/m^{2}K. Solar radiation is incident on the surface at a rate of 150 W/m^2. If both the emissivity and the solar absorptivity of the outer surface are 0.8, determine the effective thermal conductivity of the wall. **[5]**

Total No. of Questions : 7]

P4649

SEAT No. :

[Total No. of Pages : 3

[4860] - 1060

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

AIR CONDITIONING TECHNOLOGY

(2013 Pattern)

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

Instructions to the candidates:

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

Q1) An air conditioned space is maintained at 26 °C DBT and 50% RH when outdoor conditions are 35 °C DBT and 28 °C WBT. The space has sensible heat gain of 17.6 kW and the air to the space is supplied at a condition of 8 °C saturated. **[10]**

Determine:

i) The mass and volume flow rate of the air supplied.

ii) Latent heat load in the room.

iii) The cooling load of the refrigeration plant if 15% of the total mass of air supplied to the space is fresh air and remaining is recirculated air.

Q2) Write short note on **[10]**

a) Fresh air calculations and considerations for IAQ.

b) Types of fans and selection criteria for Air conditioning applications.

Q3) A space is to be maintained at 27 °C DBT and has a rate of sensible heat gain of 13 kW and a rate of latent heat gain of 8.5 kW. The mass flow rate of air supplied to the space is 1.1 kg/s. Outdoor air at 38 °C DBT and 17 °C DPT is introduced into the system at a rate of 0.28 kg/s. The air at the exit of the cooling coil is saturated and at a temperature of 7 °C. **[10]**

i) Clearly sketch and label all the points and process lines on psychrometric chart.

ii) Determine DBT and RH of the air supplied to the space.

iii) RH of the air in the space

iv) Refrigeration load.

Q4) Explain the procedure of static regain method of duct design. With a suitable example highlight the drawbacks of static regain method of duct design. **[10]**

Q5) a) Explain displacement ventilation system. List its advantages, limitations and applications. **[5]**

b) Explain the factors taken into consideration while selecting air conditioning system for hospital application. **[5]**

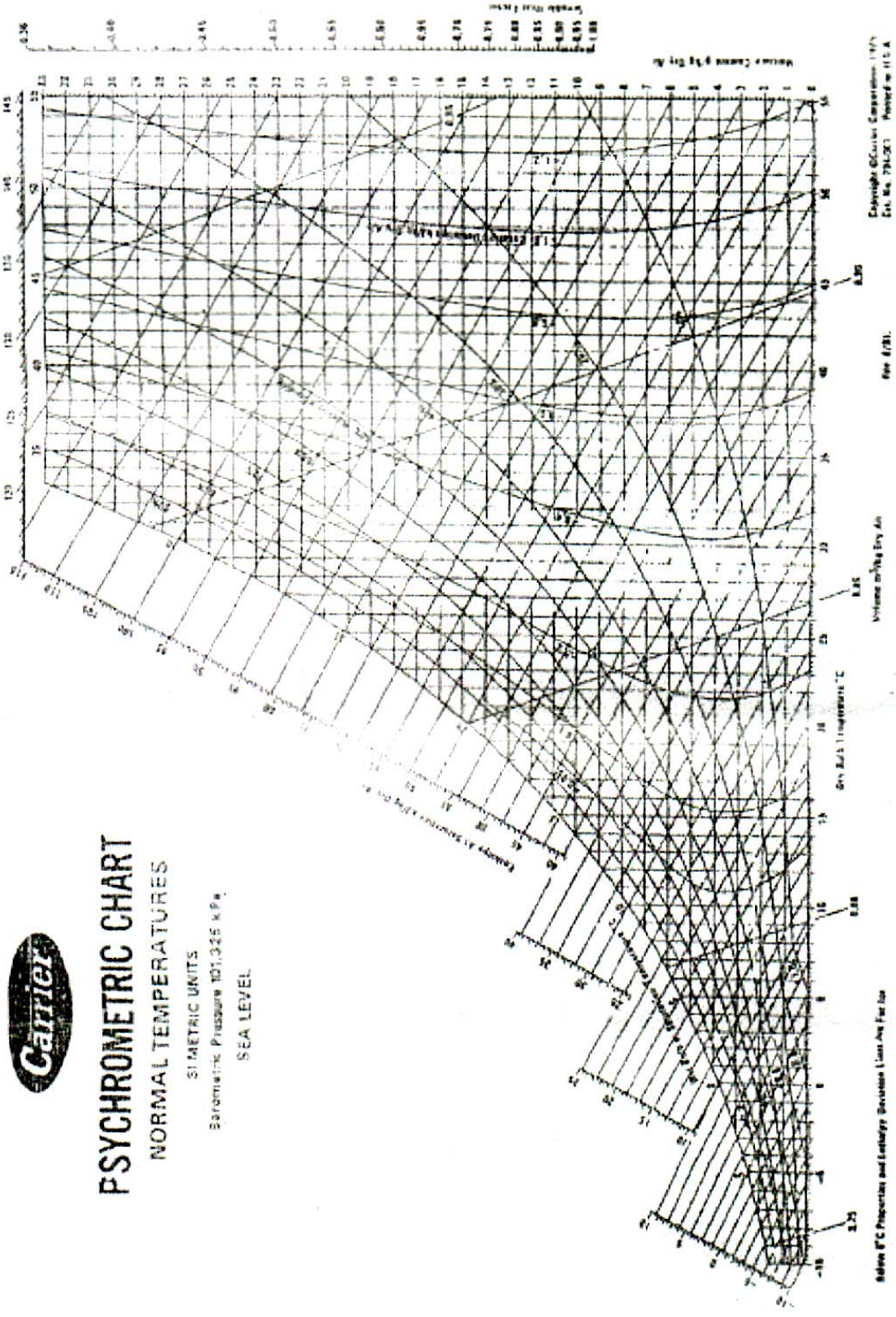
Q6) Write short note on **[10]**

a) Types of heat pumps

b) Types of control system for air conditioning

Q7) a) Compare single stage and two stage evaporative cooling. **[5]**

b) Write a note on desiccant dehumidification systems. **[5]**


Carrier
PSYCHROMETRIC CHART
NORMAL TEMPERATURES
SI METRIC UNITS
SEA LEVEL

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Total No. of Questions : 8]

SEAT No. :

P4656

[Total No. of Pages : 2

[4860] - 1061

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

MEASUREMENTS AND CONTROLS

(2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Assume suitable data, if necessary.***
3) ***Use of calculator is allowed.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Describe the difference between deflection and null type of instruments giving suitable example. **[5]**

b) Explain with sketches the different types of drifts of input-output relationships. **[5]**

Q2) a) The following measurements of a particular dimension of a mass produced automobile component were made and tabulated by an engineer. Find the mean, median and mode. **[6]**

Class boundaries (cm)	frequency (f)
4.35-4.45	1
4.45-4.55	4
4.55-4.65	8
4.65-4.75	15
4.75-4.85	11
4.85-4.95	9
4.95-5.05	2

b) What are the different standard inputs for studying the dynamic response of a system? Define and sketch them. **[4]**

P.T.O.

Q3) a) Explain the measures taken to minimize systematic errors. **[5]**

b) Describe the construction and working of total Radiation Pyrometer to measure temperature. **[5]**

Q4) a) Explain Gardon foil type heat flux meter with sketch. **[5]**

b) Explain the working of McLeod gauge for measurement of very low pressure. **[5]**

Q5) a) The following sound pressure levels were measured for a Machine operating in a noisy environment. **[5]**

SPL of Machine + background noise = 90 dB

SPL of the background noise = 80 dB

Determine the SPL of the machine alone.

b) Explain the construction and working of Turbine flow meter. **[5]**

Q6) a) Under what conditions is a seismic instrument suitable for **[5]**

i) amplitude measurements and

ii) acceleration measurements

b) Explain how the torque can be measured on a rotating shaft. **[5]**

Q7) a) Describe Proportional Integral (PI) mode of control in hydraulic control system. **[5]**

b) In a gear type transmission dynamometer, the input and output shafts are co-axial and rotate in the same direction at speeds of 1600 and 400 rpm, respectively. An external torque is applied to the casing to prevent it from rotating using a mass of 120 kg at a distance of 30 cm from the axis. The overall mechanical efficiency is 90%. Find the power at the input shaft. **[5]**

Q8) a) With the help of a sketch, describe the working of Electronic Proportional Controller. **[5]**

b) Design a Control system for temperature control in a Metal-Melting furnace. **[5]**

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Total No. of Questions : 7]

SEAT No. :

P4640

[Total No. of Pages : 2

[4860] - 1062

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

COMPUTATIONAL FLUID DYNAMICS

(2013 Pattern)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data, if necessary and mention it clearly.***

Q1) a) Write the canonical form of partial differential equations with practical examples. Explain in detail the mathematical nature of Parabolic equations with example. **[6]**

b) Explain Reynolds transport theorem and its significance in detail. **[4]**

Q2) a) Write in detail the CFD analysis process of the numerical solution of flow through backward facing step having step height as characteristics length scale. In this case assume length unity. Setup the problem with suitable initial and boundary conditions in detail. Write all the steps involved in the simulation and explain with neat sketches. **[6]**

b) Which of the following, forward difference, backward difference and central difference, is most accurate and why? **[4]**

Q3) a) Classify the following system of equations. **[5]**

$$\frac{\partial u}{\partial t} + a\frac{\partial u}{\partial x} + b\frac{\partial v}{\partial y} = 0 \quad ; \quad \frac{\partial v}{\partial t} + b\frac{\partial u}{\partial x} + a\frac{\partial v}{\partial y} = 0$$

P.T.O.

b) Explain finite volume method and illustrate it for the generalized two dimensional first order conservation equation written in state variable Φ.

$$\frac{\partial \varphi}{\partial t}+\frac{\partial F(\varphi)}{\partial x}+\frac{\partial G(\varphi)}{\partial y}=0$$

where, Φ is state variable vector and $F(\Phi), G(\Phi)$ are and flux vectors for two dimensional continuity equation and inviscid momentum equation in x and y direction respectively. **[5]**

Q4) a) For unsteady convection - diffusion process, what is the difference between explicit and implicit time-marching approaches? Explain any one implicit time-marching method in detail. **[5]**

b) Derive stability condition for Lax-Wendroff scheme. Comment on the stability criteria. **[5]**

Q5) a) What is upwind method? Why upwind schemes are important for strongly convective flow? **[5]**

b) Write in brief different types of grid generation used in CFD simulations. Explain in detail Delaunay triangulation. **[5]**

Q6) a) Two parallel plates with infinite length are kept 40mm apart. The fluid within the plates has kinematic viscosity of $2.17 \times 10^{-4} m^2/s$ and density $800 kg/m^3$. The lower plate is stationary and the upper plate is moving with velocity 40 m/s. Find the velocity distribution within fluid in y-direction for one time step (Δt), Discretize the domain with five nodes and apply Crank-Nicolson's implicit method. Take $\Delta t = 0.55$. The governing equation is given by **[5]**

$$\rho \frac{\partial u}{\partial t}=\mu \frac{\partial^2 u}{\partial^2 y}$$

b) Differentiate between density based and pressure based solvers. Explain in detail, step by step, pressure based algorithm commonly used. **[5]**

Q7) a) What is turbulence modeling? Explain any suitable two-equation model for an external flow. **[5]**

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

i) Conformal and non-conformal grids.

ii) Closure problem.

Total No. of Questions : 4]

P4585

SEAT No. :

[Total No. of Pages : 2

[4860] - 1063

M.E. Mechanical (Heat Power Engineering)

DESIGN OF HEAT TRANSFER EQUIPMENTS

(2013 Credit Pattern) (Semester - III)

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

Instructions to the candidates:

1) ***All questions are Compulsory and answers should be written in one Ans Book only.***
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 chemical plant produces 300 tones of sulphuric acid per day. The acid is to be cooled from 333 K to 313 K in a day with 500 tones of water at initial temperature of 288 K. A counter flow cooler consisting of concentric pipes 12.5 mm thick is to be used. The inner pipe through which the acid flows is 75 mm bore and outer one is 125 mm bore. The outside diameter of inner pipe is 100 mm. Thermal Conductivity of pipe material is 46.52 W/m K. Use Dittus-Boelter equation for turbulent condition. Calculate length of pipe required. The physical properties of fluid at mean temperature are as follows: **[13]**

Property	Acid	Water
Density (kg/m^3)	1800	998.2
Heat Capacity (kJ/kg K)	1.465	4.187
Thermal Conductivity (W/m K)	0.302	0.669
Viscosity (N s/m^2)	0.0112	0.0011

Q2) 1-2 shell and Tube heat exchanger is to be used to heat a crude oil from 295 K to 330 K with the help of bottom product of distillation unit that is to be cooled from 420 K to 380 K. Crude oil flows through shell at a rate of 106000 kg/hr flows through shell of inside diameter 600mm consists of 324 tubes of 19mm O.D. of wall thickness of 2.1 mm, each 4.88 m long arranged on 25 mm square pitch and supported by segmental baffles spaced 0.23 m apart. Combined dirt factor of 0.001 m^2 K/W is to be provided. Is this heat exchanger is suitable i.e. what is the dirt factor? Please Comment on it. Use Kern's method for outside heat transfer coefficient and Dittus-Boelter equation for tube side fluid. **[13]**

P.T.O.

Properties of the fluids are as follows:

Properties of Crude oil	
C_p = 1.986 kJ/kg K	$\mu = 2.9 \times 10^{-3}$ Ns/m^2
k = 0.136 W/m K	ρ = 824 kg/m^3
Properties of bottom product	
C_p = 2.202kJ/kg K	$\mu = 5.2 \times 10^{-3}$ N s/m^2
k = 0.119 W/m K	ρ = 867 kg/m^3

Q3) a) What is Thermal Interface material? State its properties. Give examples. **[4]**

b) Write note on effect of fin density on fouling. **[4]**

c) Explain Wilson Plot Technique for heat Exchanger. **[4]**

Q4) a) Explain working of Cooling tower. Explain at least two types with sketches What are the materials of construction for cooling tower? **[4]**

b) Explain concept of heat pipe with sketch. **[4]**

c) What is steam trap? Explain its working with the help of proper sketch. **[4]**

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Total No. of Questions : 8]

SEAT No. :

P4259

[Total No. of Pages : 3

[4860]-1064

M.E. (Mechanical) (Design Engineering)

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

Q1) a) Apply Gram-Schmidt method to the given vectors to get an orthonormal basis.

(1, 2, 1), (–3, –4, –1) and (–4, –7, 0). **[5]**

b) Evaluate $\oint_C \frac{\left(z^2+\cos^2 z\right)}{\left(z-\pi/4\right)^3} dz$ where C is $|z|=1$. **[5]**

Q2) a) If $\omega = \phi + i\psi$ represents the complex potential for an electric field and $\phi = -2xy + \frac{y}{x^2+y^2}$, determine the function ψ. **[5]**

b) Find the Laplace transform of $t^2\, u(t-3) + e^{2t}\cos 3t\, \delta(t-2) + e^{2t}\ erf\ 2\sqrt{t}$. **[5]**

Q3) a) Solve by series method the following equation.

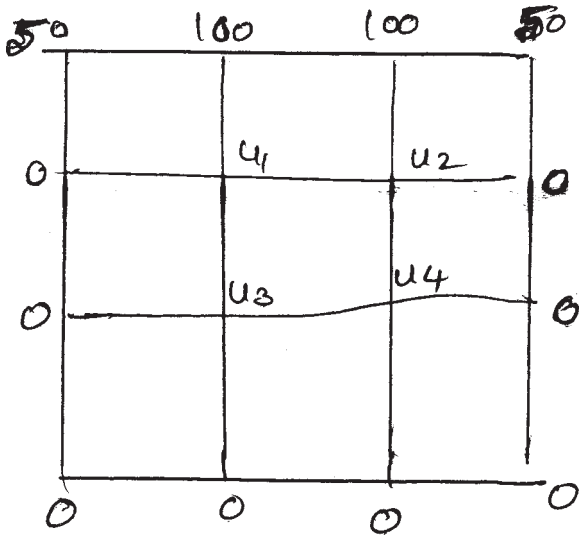
$$\left(1-x^2\right)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 0.$$ **[5]**

P.T.O.

b) Using Laplace transform, find the solution of the initial value problem.

$$\frac{d^2y}{dx^2}+4\frac{dy}{dx}+4y=6e^{-t},\ y(0)=-2,\ y'(0)=8.$$ **[5]**

Q4) a) Solve $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ for the given square mesh with boundary conditions as given. **[5]**



b) Find the numerically largest eigen values and corresponding eigen vectors for the following matrix $A=\begin{bmatrix}1 & 3 & -1\\ 3 & 2 & 4\\ -1 & 4 & 10\end{bmatrix}$ by power method. **[5]**

Q5) a) Given $\frac{\partial^2 f}{\partial x^2}-\frac{\partial f}{\partial t}=0;\ f(0,t)=f(5,t)=0,\ f(x,0)=x^2(25-x^2)$; Find the values of f for x and t with h = 1, using Bendre's Schmidt method. **[5]**

b) Using Rayleigh-Ritz Method solve the boundary value problem $y''-y+4xe^x=0, y(0)=0=y(1)$. **[5]**

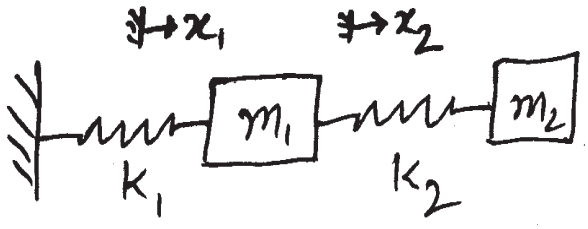
Q6) a) Find the extremal of $\int_1^2 \frac{x^3}{(y')^2}\,dx$ with $y(1) = 0, y(2) = 3$. **[5]**

b) Solve the system of equations by least square method $x - y = 2$, $x + y = 4$, $2x + y = 8$. **[5]**

Q7) a) Find the image of the triangular region bounded by $x = 0, y = 0, x + y = 1$ under the transformation $w = z^2$. **[5]**

b) Find the Fourier sine transformation of the function $f(x) = e^{-|x|}$. Hence evaluate $\int_0^\infty \frac{x \sin mx}{1+x^2}\,dx$. **[5]**

Q8) a) For the system of masses & spring in the figure below $m_1 = 2$, $m_2 = 1$, $k_1 = 4$ and $k_2 = 2$, assuming there is no friction. Find natural frequencies of the system and corresponding normal modes of vibration using matrix method **[5]**



b) The function U satisfies the equation $\frac{\partial^2 U}{\partial t^2} = \frac{\partial^2 U}{\partial x^2}$, $0 \le x \le 1$; subject to the initial conditions $u(x,0) = \sin \pi x$, $0 \le x \le 1$ & $U_t(x,0) = 0$ with boundary conditions $u(0,t) = u(1,t) = 0, t > 0$ by taking h = 0.2 upto five levels. **[5]**

Total No. of Questions : 7]

SEAT No. :

P4260

[Total No. of Pages : 2

[4860]-1065

M.E. (Mechanical) (Design Engineering)

MATERIAL SCIENCE AND MECHANICAL BEHAVIOR OF MATERIALS

(2013 Credit Pattern) (Semester - I) (502202)

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 table slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume Suitable data whenever necessary.***

Q1) A steel piece initially has a uniform carbon concentration of 0.25 wt% and is to be treated at 950°C. 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 0.5mm below the surface? The diffusion coefficient for carbon in iron at this temperature is 1.6×10^{-11} m^2/s **[10]**

Assume that the steel piece is sem-infinite.

Given

Z	erf(z)
0.30	0.3286
0.35	0.3794
0.40	0.4284
0.45	0.4755

Q2) For the stress matrix given below, determine the principal stresses and directional cosines associated with the normals to the surfaces of each principal stress. **[10]**

$$[\sigma] = \begin{bmatrix} 3 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix} \text{MP}a$$

P.T.O.

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 50mm. diameter in the middle of the gauge section and machined the rest of it to a diameter of 50.5mm. 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) Explain the following terms: **[10]**

a) Isotropic hardening.

b) Kinematic hardening.

c) Independent hardening

d) Bauschinger effect

Q5) Explain residual bending stresses in a beam of rectangular cross section. **[10]**

Q6) Explain Elastic-plastic torsion of a solid circular shaft. **[10]**

Q7) What is viscoelasticity? Explain Kelvin model of viscoelesticity. **[10]**

Total No. of Questions : 7]

P4586

SEAT No. :

[Total No. of Pages : 2

[4860] - 1066
M.E. (Mechanical) (Design Engineering)
ADVANCED STRESS ANALYSIS
(2013 Credit Pattern) (Semester - I)

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) ***Draw Diagrams wherever necessary.***
4) ***Use of scientific calculator is allowed.***
5) ***Assume suitable data where ever necessary.***

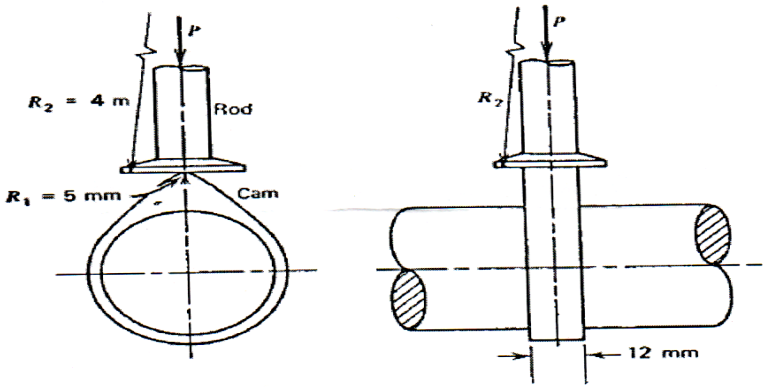
Q1) A problem is represented by the function. **[10]**

$$\phi = \frac{3W}{4h}\left[xy - \frac{2Ry^3}{3h^2}\right] + \frac{P}{2}y^2$$

Where, h is half depth of the beam, and W as the concentrated load. Investigate the stress function and determine the stress components.

Q2) Derive the following expression for uniformly loaded circular plate with clamped **[10]** edges. $W = \frac{q}{64D}(a^2 - x^2)^2$

Q3) A cast iron push rod as shown in figure below (E = 117 GPa, v = 0.20) in a valve assembly is operated by a steel cam (E= 200 GPa, v = 0.29). The cam is cylindrical in shape and has a radius of curvature of 5 mm at its tip. The surface of the push rod that contacts the cam is spherical in shape with a radius of curvature 4 m so that the rod and cam are in point contact. If allowable maximum principal stress for cast iron is - 1400MPa, determine the maximum load P that may act on the rod. **[10]**



P.T.O.

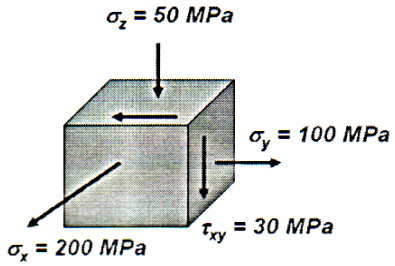
Q4) Following strains were obtained on a delta rosette ε_a = 190 μm/m (at 0°), ε_b = 200 μm/m (at 60°), and ε_c = – 300 μm/m (at 120°). Calculate maximum principal strain direction, the principal stresses and the maximum shear stress. Take E = 200 GPa, v = 0.285 **[10]**

Q5) Write a short note on **[10]**

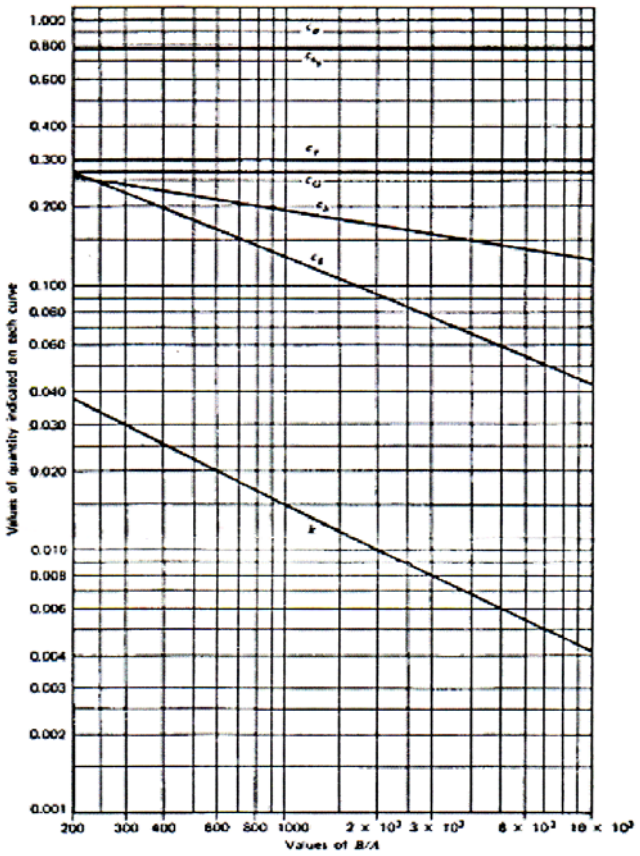
a) Sliding Friction Consideration in Contact Stress Analysis

b) Rectangular Strain Gauge Rossette.

Q6) Stress analysis of a spacecraft structural member gives the state of stress shown below. If the part is made from 7075-T6 aluminium alloy with yield strength of 500 MPa, will it exhibit yielding? If not, what is the safety factor?**[10]**



Q7) Explain typical failure modes of engineering plastics. **[10]**



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Total No. of Questions : 7]

SEAT No. :

P4261

[Total No. of Pages : 3

[4860] - 1068
M.E. (Mechanical)
DESIGN ENGINEERING
Analysis and Synthesis of Mechanisms
(2013 Credit Pattern) (Semester - II) (502207)

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 term 'Mobility of a mechanism' & discuss in brief following criterion with suitable examples. **[5]**

i) Kutzbach Criterion

ii) Grubler Criterion

iii) Grashof's Criterion

A linkage has 14 links & 5 loops. Calculate its

i) Degree of freedom

ii) Number of joints

iii) Maximum number of ternary links

b) Discuss the term 'Transmission angle' & explain how this parameter can be used to measure the performance of a mechanism. **[5]**

Explain the term 'Kinematically Complex' mechanism. Discuss the steps in kinematic analysis of complex mechanism. State the importance & applicability of the 'Auxiliary-point method'.

P.T.O.

Q2) a) What are equivalent linkages? Discuss the need of the same also state its limitation. Fig. Q.2 (a) shows generalized cam mechanism. Find out an equivalent mechanism with lower pairs only. **[5]**

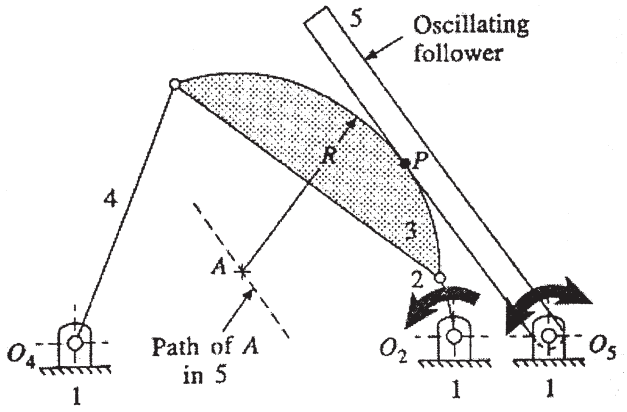


Fig. Q.2 (a)

b) Explain the steps in the dynamic force analysis for slider crank mechanism in brief. What are elastic mechanisms? **[5]**

Q3) a) Derive Euler-Savary equation. Discuss its importance. State different forms of Euler-Savary equation. **[5]**

b) What is 'Inflection Circle'? Explain Bobillier Construction. **[5]**

Q4) a) Explain the term 'Cubic of Stationary curvature'. Determine the cubic of stationary curvature for plane motion equivalent to the rolling of a circle along a fixed straight line. **[5]**

b) Discuss 3-position graphical synthesis of 4-bar mechanism for body guidance. Synthesize a 4-bar mechanism to guide a rod AB through the three consecutive positions A_1B_1, A_2B_2 & A_3B_3 as shown in Fig. Q.4 (b). **[5]**

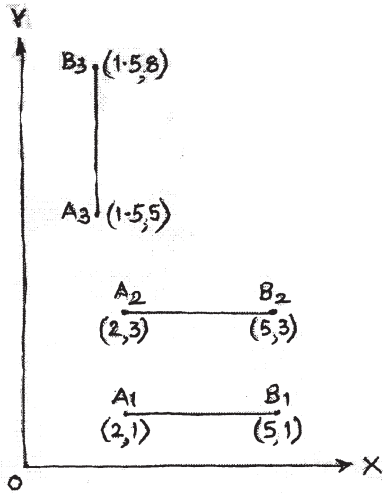


Fig. Q.4 (b)

Q5) a) Discuss spacing of accuracy points using Chebyshev polynomial. Explain the 'error curve with three accuracy points' & 'optimum error curve'. What are the branch and order defects? **[5]**

b) Discuss the procedure to synthesize 4-bar linkage for given angular velocity & acceleration using Freudenstein's equation. Using this method, design a 4-bar linkage meeting the following specifications of position, velocity & acceleration. **[5]**

Parameters	Crank (Input link)	Follower (Output link)
Angle	$\phi = 90^{o}$	$\psi = 90^{o}$
Angular velocity	$\omega_{\phi} = 3 \text{rad/sec}$	$\omega_{\psi} = 1.20 \text{rad/sec}$
Angular acceleration	$\alpha_{\phi} = 0 \text{rad/sec}^2$	$\alpha_{\psi} = 1.62 \text{rad/sec}^2$

Q6) a) Using complex number notations, derive the link lengths a_1, a_2, a_3 & a_4 for a 4-bar mechanism in terms of angular velocity & angular acceleration. Using Complex number method, determine the proportions of a 4-bar linkage that will in one of its position have parallel crank & follower & satisfy the following specifications, **[5]**

Parameters	
Angular velocity	Angular acceleration
$\omega_1 = 3.00 \text{rad/sec}$	$\alpha_1 = 0 \text{rad/sec}^2$
$\omega_2 = 0 \text{rad/sec}$	$\alpha_2 = 1 \text{rad/sec}^2$
$\omega_2 = 1 \text{rad/sec}$	$\alpha_2 = 0 \text{rad/sec}^2$

b) What is 'cognate mechanism'? Discuss Robert Chebyshev theorem for the same. State the factor on which the choice of cognate mechanism depends. **[5]**

Q7) a) What is 'Spatial Mechanism'? Discuss it in brief with examples. What are Denavit-Hartenberg (D-H) parameters. Explain the use of D-H parameters with suitable example. **[5]**

b) Discuss the steps involved in matrix method of analysis of spatial mechanism taking 4R Spherical mechanism (Hooke's Joint) as an example. **[5]**

Total No. of Questions : 7]

SEAT No. :

P4262

[Total No. of Pages : 2

[4860] - 1069

M.E. (Mechanical) (Design Engineering)

ADVANCED MECHANICAL VIBRATIONS

(2013 Credit Pattern) (502208) (Semester - II)

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

Instructions to the candidates:

1) ***Answer any FIVE questions***
2) ***Neat Diagrams must be drawn whenever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculator is allowed.***

Q1) A double pendulum has lengths of L_1 and L_2, with masses m_1 and m_2 at the end of each massless link as shown in Fig.1. Use Lagrange's equation to derive the equations of motion. **[10]**

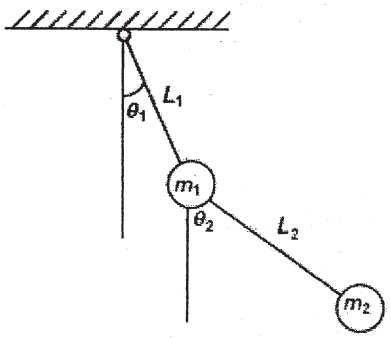


Fig. 1. double pendulum

Q2) Find the natural frequencies for bar as shown in Fig. 2. **[10]**

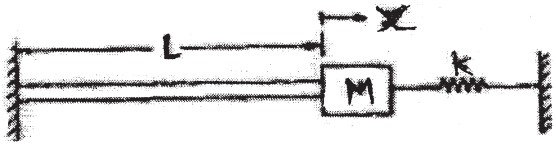


Fig.2

P.T.O.

Q3) Determine the equation of motion of the mass for free vibration as shown in Fig.3 with following details; m = 10kg, k = 1000N/m, C = 100N.s/m, $x(0)$ = 1.0001m, $\dot{x}$ = 0.10m/s. **[10]**

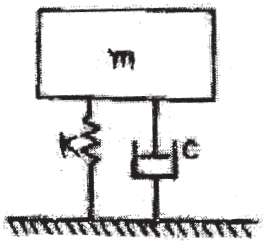


Fig.3

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

a) the relationship between response speed and mass ratio.

b) frequency response curves for main system and absorber.

Q5) a) Explain FFT analyzer with a block diagram. **[5]**

b) Explain practical applications of model analysis in car chassis. **[5]**

Q6) A random signal has a spectral density that is a constant, S(f) = 0.004cm^2/cps between 20cps and 1200cps and that is zero outside this frequency range. It mean value is 2.0cm. Determine its rms value and its standard deviation. **[10]**

Q7) Write note on (any Four): **[10]**

a) Holzer Method.

b) Duhamels Integral.

c) In-situ Balancing.

d) Power Spectral Density Analyser.

e) Centrifugal Pendulum.

Total No. of Questions : 8]

SEAT No. :

P4263

[Total No. of Pages : 2

[4860] - 1070
M.E. (Mechanical Design)
FINITE ELEMENT METHOD
(2013 Credit Pattern) (502209) (Semester - II)

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

Instructions to the candidates:

1) ***Solve any five questions***
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) Write short note on (any two): **[10]**

a) Plain stress and plain strain problem.

b) Characteristics of Global Stiffness Matrix.

c) The Gelerkin Method.

Q2) Evaluate using 2 point Gaussians quadrature method. **[10]**

a) $$I=\int_{-1}^{1}\left[3e^{x}+x^{2}+\frac{1}{(x+2)}\right]dx$$

b) $$I=\int_{-1}^{1}\left[\cos\frac{\pi x}{2}\right]dx$$

Q3) Explain the difference between p and h refinements in Finite Element Method & Write its significance. **[10]**

Q4) What is modal analysis? What are mode shapes? Explain with suitable example. **[10]**

P.T.O.

Q5) Explain lumped mass matrix and consistent mass matrix with suitable example. **[10]**

Q6) How to decide finite element mesh density for vibration and acoustic analysis? **[10]**

Q7) Explain Numerical integration by Simpson's $1/3^{rd}$ rule in detail. Comment on difference between Implicit and Explicit Numerical schemes. **[10]**

Q8) Compute $I=\int_e N_1 N_2 N_3 dA$, where N_i are the linear shape functions for the 3-noded CST element. **[10]**

Total No. of Questions : 7]

P4587

SEAT No. :

[Total No. of Pages : 2

[4860] - 1071

M.E. (Mechanical-Design Engineering)

OPTIMIZATION TECHNIQUES

(2013 Credit Pattern) (Semester - III)

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

Instructions to the candidates:

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

Q1) a) Define Optimization. What are applications of optimization in engineering? **[6]**

b) Describe following (any two) **[4]**

i) Objective function

ii) Constraint surface

iii) Design Vector

Q2) a) Minimize $f(x)=(x_1^2 + x_2^2 + x_3^2)/2$ subjected to $g_1(x)=x_1 - x_2 = 0$ and $g_2(x)= x_1 + x_2 + x_3 = 0$ by direct substitution method. **[5]**

b) Determine the maximum and minimum values of the function $f(x)=12x^5 - 45x^4 + 40x^3 + 5$ **[5]**

Q3) a) Solve following LPP by simplex method **[10]**

Maximize $Z = 4000x_1 + 2000x_2 + 5000x_3$

Subjected to $12x_1 + 7x_2 + 9x_3 \leq 1260$

$22x_1 + 18x_2 + 16x_3 \leq 19008$

$2x_1 + 4x_2 + 3x_3 \leq 396$

And $x_1, x_2, x_3 \geq 0$

Q4) a) Write a note on following (any one) **[5]**

i) Golden section method

ii) Powells method of optimization

b) Find the minimum of $F(x)=x(x - 1.5)$ in the interval of (0.00, 1.00) to within 10% of the exact value using exhaustive search method. **[5]**

P.T.O.

Q5) a) Explain simulated annealing optimization and state its advantages. **[5]**

b) Write a note on following (any two) **[5]**

i) Genetic algorithm

ii) Artificial neural network

iii) Fuzzy Optimization

Q6) a) What is Topology optimization? Explain with suitable example. **[5]**

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

Q7) Explain following (any two) **[10]**

a) Bi-Directional evolutionary optimization method

b) ESO for stress level optimization

c) ESO for stiffness optimization

Total No. of Questions : 8]

P4588

SEAT No. :

[Total No. of Pages : 2

[4860] - 1072

M.E. (Mechanical) (Design Engineering)

MECHANICAL MEASUREMENTS AND CONTROL

(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) What are the important characteristics of a measuring instrument? **[6]**

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

i) Dynamic error
ii) Static error
iii) Probable error
iv) Mean standard deviation

Q2) a) Explain the properties correlation co-efficient. **[4]**

b) In a partially destroyed record, the following data available. **[6]**

Variance of x = 25

Regression equation x upon y is 5x – y = 22

Regression equation y upon x is 64 x – 45y = 24

Determine

i) Mean value of x & y
ii) Co-efficient of correlation between x & y

Q3) a) Determine co-efficient of correlation between employment & sales given **[6]**

Employment (person)	22	31	90	82	43	62	59	16	61	46	35	50
Sales(Rs.)	250	98	980	850	710	280	530	180	670	420	190	460

b) What are the various types of correlations **[4]**

P.T.O.

Q4) a) Explain with a neat sketch the working of hot wire anemometer. **[5]**

b) Explain the method of measurement of pressure of 0.001mm of Hg. **[5]**

Q5) a) A disc mounted on a shaft of a machine has 12 pattern points. The no. of flashes projected on the disc is 6000 per minute. **[6]**

Find

i) The speed of machine if the disc appears stationary and has a single image of 12 points.

ii) If the dics appears to move forward in the direction of rotation by 10rpm, what is the speed of disc.

b) What are the methods of measuring **[4]**

i) humidity

ii) level

Q6) a) Differentiate between time domain and frequency domain modelling approach. **[4]**

b) A plot of error vs. time for a control system is shown in fig.1 $u_p = 1$. N/deg. & $u_D = 2$s. Find the maximum positive and negative values of derivative output. **[6]**

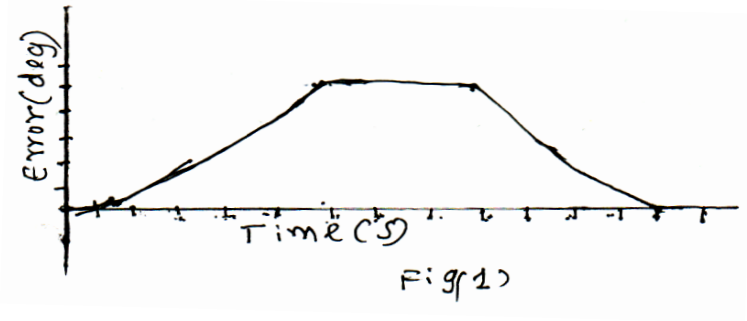


Fig 1)

Q7) a) What are transient response specifications. **[5]**

b) Represent a generic state space model using the block diagram approach and define the elements of the block diagram. **[5]**

Q8) a) Using Routh-Hurwitz criterion find the closed loop stability of the system given below **[6]**

$$\frac{C(s)}{R(s)} = \frac{2s+1}{S^3+3s^2+3s+1}$$

b) Explain how derivative feedback control system maues. more responsive to rapid changes and how it reduces overshoot **[4]**

Total No. of Questions : 7]

SEAT No. :

P4264

[Total No. of Pages : 2

[4860] - 1073

M.E. (Mechanical - Mechatronics)

SYSTEM MODELLING, IDENTIFICATION & SIMULATION

(2013 Credit Pattern) (502801) (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) For the system in Fig 1, determine the transfer function $x(s)/y(s)$. Assume m = mass = 1kg, k = spring stiffness = 2 N/m and b = damping = 0.5 Ns/m. Also, x is the system output and y is the system input, which is motion of the base on which the system rests. **[10]**

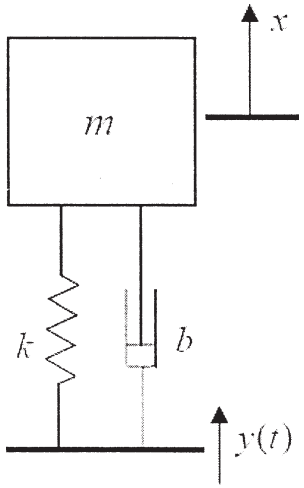


Fig 1

Q2) Draw a suitable diagram and discuss how the "Distributed Systems" approach can be used to model a cantilever beam. **[10]**

Q3) Derive the bond graph model for the mechanical system shown in Fig. 1.**[10]**

P.T.O.

Q4) Draw a suitable flowchart and explain the working of the Least Square based identification of a second order system. **[10]**

Q5) Draw a suitable block diagram and explain the process of identification of system model from the frequency response. **[10]**

Q6) Write the equations for the Linear Kalman Filter and explain its working. **[10]**

Q7) Data set for a straight line is given in Table 1. Identify a first order model to fit this set using the Least Square technique. **[10]**

Table 1

x	1	2	3	4	5	6	7
y	0.5	2.5	2	4	3.5	6	5.5

Total No. of Questions : 7]

SEAT No. :

P4265

[Total No. of Pages : 2

[4860] - 1074

M.E. (Mechanical - Mechatronics)

CONTROL SYSTEM - I

(2013 Credit Pattern) (502802) (Semester - I)

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

Instructions to the candidates:

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

Q1) a) For the mass spring damper system shown inFig Q1 (a), determine the A, B, C and D matrices of its state space model. **[6]**

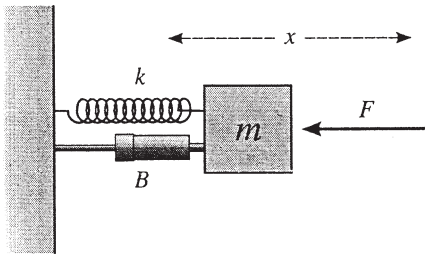


Fig Q1 (a)

b) List any three advantages of Open Loop control system over Closed Loop control system. **[4]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -3.98 & -796.5 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$$

Eq. (1)

$$y = [3.98 \;\; 796.5] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + [0]u$$

P.T.O.

Q2) a) Derive the equivalent transfer function from the model in Eq.(1). **[5]**

b) For the model in Eq. (1) determine the poles and zeros and comment on the stability of the system. **[5]**

Q3) a) Discuss the significance of Controllability W.R.T. Full State Feedback Control. **[5]**

b) Define Condition Number and explain its importance W.R.T. Full State Feedback Control. **[5]**

Q4) For the model in Eq. (1), determine a full state feedback gain, k, such that the desired closed loop system has an overshoot of 5% and 2% settling time of 1 second. **[10]**

Q5) a) Considering the state space model in Eq. (1), derive the *state matrix* of the closed loop system using the full state feedback gain k from Q4. **[5]**

b) Using the Ackerman's method build an observer such that the observer poles are located at 5 times the closed loop poles. Consider the closed loop poles to be of the closed system from Q4-(b). **[5]**

Q6) a) Draw a suitable block diagram and explain the significance of adding the Integral Term to the Pole Placement based FSF control. **[6]**

b) Assess the closed loop stability of system represented in Eq. (2) using Routh's method. **[4]**

$$x^3 + 3x^2 + 3x + 1 = 0 \qquad \text{Eq. (2)}$$

Q7) a) Draw a suitable block diagram and explain the working of a compensator. **[5]**

b) Draw a suitable diagram of a Observer and discuss its importance in a control system. **[5]**

Total No. of Questions : 7]

SEAT No. :

P4266

[Total No. of Pages : 2

[4860] - 1075

M.E. (Mechanical - Mechatronics)

SENSORS, TRANSDUCERS & INTERFACING TECHNIQUES

(2013 Credit 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) ***Draw neat figures, diagrams wherever necessary.***
4) ***Use of scientific calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain the general considerations of data analysis. **[5]**

b) The following is the distribution of hourly number of trucks arriving at a company's warehouse. **[5]**

No. of trucks	0	1	2	3	4	5	6	7	8
Frequency	52	151	130	102	45	12	5	1	2

Find the mean of this distribution & using it as parameter λ. Fit a poisson distribution. Test for goodness-of-fit at the 0.05 level of significance.

Q2) a) State the main features of DSO with the help of neat block diagram explain the working of DSO. **[5]**

b) With the help of neat diagram explain:- **[5]**

i) Hall-effect transducer.

ii) Photo conductive transducer.

Q3) a) Explain the pressure measurement using Bridgman gauge. **[5]**

b) With the help of neat diagram explain Pirani thermal conductivity gauge. **[5]**

P.T.O.

Q4) State the various techniques of flow measurement. State the main features of each technique. With the help of neat diagram explain any Two flow measurement techniques indicating the application areas. **[10]**

Q5) a) Discuss the thermocouple compensation technique in detail. **[5]**

b) Explain the technique of humidity measurement using neat diagram. **[5]**

Q6) a) Explain the strain measurement method with the help of neat diagram. **[5]**

b) Enlist important parameters of strain gauge & explain each in detail. **[5]**

Q7) a) State the important objectives of data acquisition technique. Draw generalised block diagram of DAS & explain function of each block. **[5]**

b) What is the criterion of ADC selection? With suitable block diagram explain working of successive approximation type of ADC. **[5]**

Total No. of Questions : 7]

SEAT No. :

P4641

[Total No. of Pages : 2

[4860]-1077
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 side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the basic function of each of the three major parts of the CPU. **[4]**

b) State one application for each of the following special I/O modules: **[6]**

i) High speed counter module

ii) Thumbwheel module

Q2) a) Discuss the role of PLC in industrial automation. **[2]**

b) Write a PLC program for Conveyor with three stations, one "In"., one "Out" and one "Process". Write all the assumptions, and consider RS500 Logic soft wore for PLC programming. **[8]**

Q3) a) Enlist with significance the contents words in the Counter file in PLC programming. **[4]**

b) Develop a Gate Logic and corresponding PLC ladder logic diagram for any three of the following: **[6]**

i) $Y = A + \bar{B}C + D$

ii) $Y = \bar{A}\left(B + \overline{CD}\right)$

iii) $Y = \left(A + B\right)\left(\bar{C} + D\right)$

iv) $Y = \left(ABC + D\right) + \left(E\bar{F}\right)$

Q4) Compare Count Up and Count Down Counter instruction with one example. **[10]**

P.T.O.

Q5) a) Explain significance of Boolean Algebra in PLC programming. **[4]**

b) Write a PLC program for Stair Case wiring using PLC. Write all the assumptions, types of switches used and I/O connection with respect to switches and lamp used. **[6]**

Q6) a) Compare Contactor Logic and Ladder Logic in with respect to PLC programming. **[5]**

b) Describe Examine ON and Examine OFF conditions in PLC Programming. **[5]**

Q7) a) Describe three basic elements of I/O Address. **[2]**

b) Explain the significance of START and STOP button programming in PLC? **[4]**

c) Discuss Timer Instruction used in PLC programming. **[4]**

Total No. of Questions : 7]

SEAT No. :

P4652

[Total No. of Pages : 2

[4860] - 1078

M.E. (Mechanical-Mechatronics)

CONTROL SYSTEMS - II

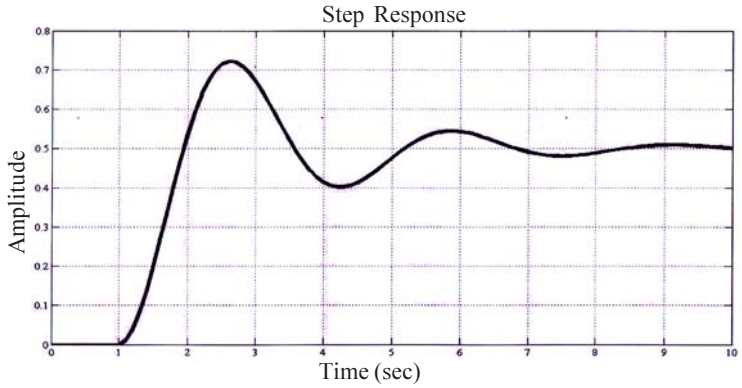
(2013 Pattern) (Semester - II)

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

Instructions to the candidates:

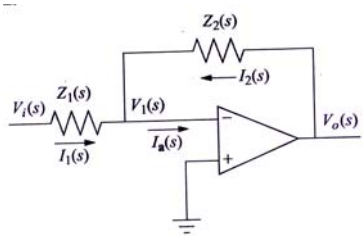
1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) The step response of a model is shown below. Using suitable technique identify the model. **[8]**



b) List two points of Differentiation between Static and Dynamic Model. **[2]**

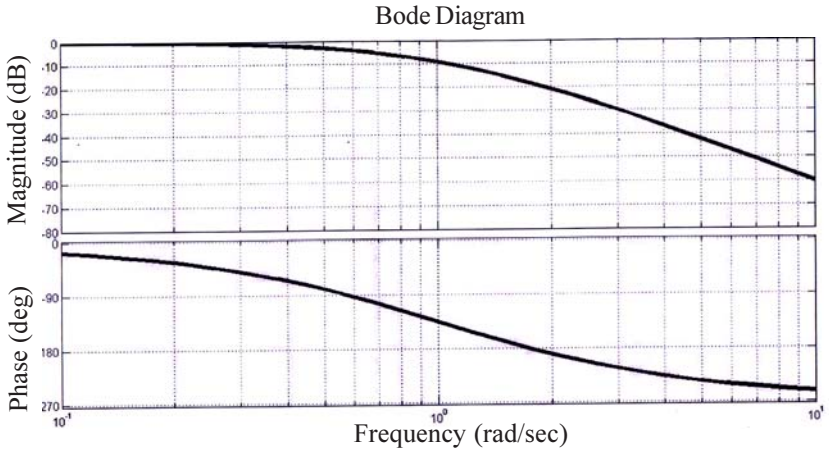
Q2) a) Derive the equation of motion for the circuit shown in figure below. **[6]**



b) List the procedure for sketching the Bode Plot. **[4]**

P.T.O.

Q3) a) Determine the approximate value of Gain and the Phase Margin from below plot. **[6]**



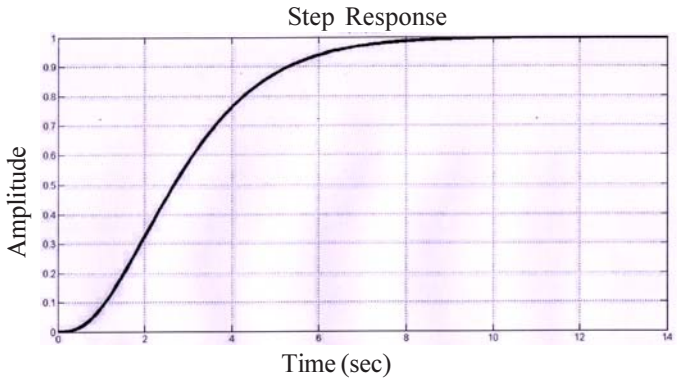
b) Draw the block diagram of the PID controller in Parallel form and derive the equation for the control signal, u. **[4]**

Q4) A second order system is under damped, inherently. Discuss the step by step procedure for manual tuning of a PID controller so that the behavior of the system becomes that of a critically damped one. **[10]**

Q5) a) Write a short note on Actuator Windup. **[5]**

b) Using a suitable example, discuss the Nyquist Stability Criterion. **[5]**

Q6) Using ZN step response method, determine the gains of the PID controller and derive the transfer function of the controller for the system, for which the step response is shown below. **[10]**



Q7) a) Discuss, in detail, the relationship between Sensitivity and Gain margin. **[5]**

b) Using a suitable example explain the ITAE controller. **[5]**

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Total No. of Questions : 8] **SEAT No. :**

P4589 **[Total No. of Pages : 2**

[4860] - 1079

M.E. Mechanical (Mechatronics) (Semester - II)

INDUSTRIAL DRIVES AND ACTUATORS

(2013 Credit Pattern)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

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

Q1) Using Speed torque conventions and multiquadrant operation give generalized treatment of Electric Drive. **[10]**

Q2) What are the different criteria's considered while selecting Electric Drive.**[10]**

Q3) a) With hydraulic circuit, explain the components involved in Hydraulic Power Pack with significance of each. **[5]**

b) Differentiate between PLC Hydraulics and Electro-Hydraulics **[5]**

Q4) Explain variable frequency square wave-VSI drive for Induction motor **[10]**

Q5) a) Explain design considerations of hydraulic cylinders used in industrial hydraulics. **[5]**

b) With respect to Construction, working and specific applications, discuss vane pump used in industrial hydraulics. **[5]**

Q6) a) Discuss Synchronous motor Load with commutated inverter drive **[4]**

b) Explain reduced voltage starting of three phase Induction motor **[6]**

P.T.O.

Q7) With hydraulic circuit and components used, discuss in brief the counterbalance valve circuit used in industrial hydraulics **[10]**

Q8) Answer any two **[10]**

a) Explain the concept of Constant power and constant torque drive.

b) Compare Pressure relief valve and sequence valve

c) Explain control of DC servo drives with the help of block diagram

Total No. of Questions : 8] **SEAT No. :**

P4590 **[Total No. of Pages : 2**

[4860] - 1080

M.E. (Mechatronics) Mechanical (Semester - III)

MICROCONTROLLER APPLICATIONS IN EMBEDDED SYSTEMS

(2013 Credit Pattern)

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) ***Assume Suitable data whenever necessary.***

Q1) a) Draw programming model of PIC18F microcontroller also discuss flags in STATUS register in detail. **[4]**

b) Explain with neat diagram data memory of PIC 18F microcontroller. **[4]**

c) Explain with example instruction format for Byte-Oriented operations. **[2]**

Q2) a) Draw and explain block diagram of PIC 18F microcontroller with MPU and memory. **[4]**

b) Explain flow charting in problem solving approach. **[4]**

c) Explain the result after the execution of the following instructions. Identify the status of flags. **[2]**

MOVLW FAH

ADDLW 38H

Q3) a) What is subroutine? Explain PIC 18 CALL and RETURN Instructions. **[4]**

b) Explain in detail interfacing of Push-Button keys. **[4]**

c) Explain stack of PIC 18F microcontroller. **[2]**

P.T.O.

Q4) a) Explain Resets used in PIC18F microcontroller. **[4]**

b) Draw and explain with block diagram Timer0 of PIC18F in 16-bit Mode. **[4]**

c) What are Hardware counters and Timers? **[2]**

Q5) a) With block diagram explain successive approximation A/D conversion. **[4]**

b) Explain standards and protocols in serial data transfer. **[4]**

c) Write different A-to-D conversion methods. **[2]**

Q6) a) Explain in detail designing of embedded systems. **[4]**

b) Explain special features of the PIC18F4520 family. **[4]**

c) List out features of embedded systems. **[2]**

Q7) a) Explain basic concepts in serial communication. **[5]**

b) Explain data transfer in Inter-Integrated circuit protocol. **[5]**

Q8) a) Explain with neat diagram support devices of PIC18F microcontroller. **[5]**

b) List and Explain the instructions used for Arithmetic operation and logical operation for PIC 18F microcontroller. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4613

[Total No. of Pages : 3

[4860] - 1081

M.E. (Mechanical) (Mechatronics)

FLEXIBLE MANUFACTURING SYSTEMS

(2013 Credit Pattern) (Semester - III)

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

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Electronic pocket Calculator is allowed.***
5) ***Assume Suitable data, if necessary and mention it clearly.***

Q1) a) Enlist function of computer system in modern manufacturing system and explain them in brief. **[4]**

b) A Small Electrical appliances is to be produced on single model assembly line. The work content of assembling the product has been reduced to the work elements listed in table. The table also lists the times for each element and the precedence order in which they must be preformed. The line is to be balanced for an annual demand of 100,000 units per year. The line will operate 50 weeks/yr, 5 shifts/week, and 7.5 hr per shift. Manning level will be one worker per station. Previous experience suggests that the uptime efficiency for the line will be 96%, and repositioning time lost per cycle will be 0.08 min. Determine

i) Total work content time Twc
ii) Required hourly production rate Rp to achieve annual demand
iii) Cycle time Tc
iv) Theoretical minimum number of workers required on the line, and
v) Service time Ts to which the line must be balanced. **[6]**

P.T.O

No.	Work Element Description	T_{Ek}	Must be preceded By
1	Place frame in workholder and clamp	0.2	-
2	Assemble plug, grommet to power	0.4	-
3	Assemble brackets to frame	0.7	1
4	Wire power cord to motor	0.1	1,2
5	Wire power cord to switch	0.3	2
6	Assemble mechanism plate to bracket	0.11	3
7	Assemble blade to bracket	0.32	3
8	Assemble motor to brackets	0.6	3,4
9	Align blade and attach to motor	0.27	6,7,8
10	Assemble switch to motor bracket	0.32	5,8
11	Attach cover, inspect, and test	0.5	9,10

Q2) a) Why are continuous work transport systems uncommon on automated production lines? **[4]**

b) A machine tool builder submits a proposal for a 20-station transfer line to machine a certain component currently produced by conventional methods. The proposal states that the line will operate at a production rate of 50 pieces per hour at 100% efficiency. On similar transfer lines, the probability of station breakdowns per cycle is equal for all stations and p=0.005 breakdowns/cycle. It is also estimated that the average downtime per line stop will be 8.0 min. The starting casting that is machined on the line costs $3.00 per part. The line operates at a cost of $75.00/hr. The 20 cutting tools (one tool per station) last for 50 parts each, and the average cost per tool = $2.00 per cutting edge. Based on data, compute **[6]**

i) Production rate

ii) Line efficiency, and

iii) Cost per unit piece produced on the line

Q3) a) Explain features on a NC machining center used to reduce nonproductive time in work cycle. **[5]**

b) Name the factors that favor the use of manual assembly lines. **[5]**

Q4) a) Define group technology (GT) & explain the features of part classfication & coding systems. **[5]**

b) Explain in brief FMS planning & implementation issues. **[5]**

Q5) a) State effect of number of workstations on an automated production line. **[5]**

b) Enlist typical products that are made by automated assembly. **[5]**

Q6) a) Explain different types of motion control modes used in NC programming. **[4]**

b) Write NC part program for the part shown in Fig.4 Assume suitable data. **[6]**

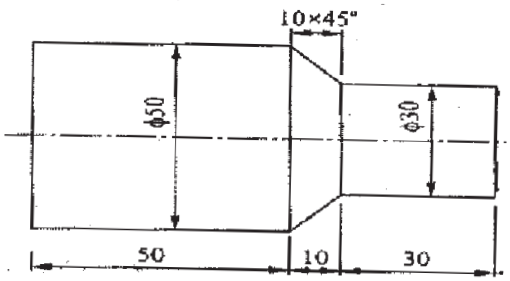

Fig. 4 Q No.6(b)

Q7) a) Differentiate between CNC & DNC. **[5]**

b) Explain in brief role of components in FMS system. **[5]**

Q8) a) Explain role of P-chart, C-chart, X&R charts in Quality Control. **[5]**

b) Discuss Taguchi method in Quality Engineering. **[5]**

Total No. of Questions : 7]

SEAT No. :

P4267

[Total No. of Pages : 2

[4860] - 1083

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

Q1) An air standard dual cycle has pressure & temp^{r} at the beginning of compression as 1 bar & 35°C respectively. The compression ratio is 11. The pressure ratio during heat addition 1.6 & cut off ratio 1.7. Calculate. **[10]**

a) The pressure, temp^{r} & volume at each point of cycle.

b) Heat added & Heat rejected.

c) Thermal efficiency of cycle.

d) Mean effective pressure.

Q2) a) A four cylinder petrol engine has an output of 52 kW at 2000rpm. A morse test is carried out & brake torque readings are 177, 170, 168 & 174 Nm respectively. A fuel consumption noted is 0.317 kg/min. Calorific value of fuel 44000kJ/kg. Calculate: **[6]**

i) Mechanical efficiency.

ii) Brake thermal efficiency.

iii) Indicated thermal efficiency.

b) What do you mean by octane number & cetane number. **[4]**

P.T.O.

Q3) a) What is the basic philosophy involved in design of connecting rod. **[5]**

b) What is the basis for material selection for design of valve assembly. **[5]**

Q4) a) What are the different engine variables that affect magnitude of heat flux to combustion chamber walls. **[5]**

b) What are the different parameters considered for selection of engine for particular application. **[5]**

Q5) Design a piston for four stroke diesel engine. **[10]**

a) Piston diameter = 87mm.

b) Stroke length = 96mm.

c) Mean effective pr = 0.7 N/mm^2.

d) BSFC = 0.26 kg/kWhr.

e) L/r = 4.

f) Heat conducted through crown = 10% of combustion.

g) Calorific value of fuel = 42 MJ/kg.

Assume η_{mech} = 80% & $P_{max} = 8 \times P_{meq}$.

Q6) a) Describe the types of Forces acting on crankshaft. **[5]**

b) Explain the factors to be considered in general engine design. **[5]**

Q7) Write short notes on (any two): **[10]**

a) Catalytic converter.

b) Forces acting on connecting rod.

c) Selection of bore to stroke ratio.

Total No. of Questions : 7] **SEAT No. :**

P4591 **[Total No. of Pages : 2**

[4860] - 1084

M.E. (Mechanical - Automotive Engineering (Semester - I)
AUTOMOTIVE SAFETY AND REGULATIONS
(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) What do you understand by vehicle safety? What are the objectives of it? List out various provisions of safety aspects incorporated in a modern car? **[5]**

b) What is vehicle crashworthiness? What are various characteristics of it? **[5]**

Q2) a) Discuss importance in ergonomics in automotive safety. **[5]**

b) Explain various features for Hybrid III dummy used in frontal crash test. **[5]**

Q3) a) Describe role of side door intrusion beam in providing passive safety in cases of side impacts. **[5]**

b) Explain role of bumper during impacts? Describe damageability criteria in bumper design? **[5]**

Q4) a) What testing procedure is followed for lamps and reflectors in automotive testing laboratory? Explain beam pattern and specification followed for head lamp testing as per CMVR rules. **[5]**

b) What are different types of automobile head lamp designs used in today's cars? Expalin with sketch. **[5]**

P.T.O.

Q5) a) Explain briefly construction and working principle of head lamp used in automobile. **[5]**

b) Explain asymmetrical beam used in head lamp. What is merits and demerits of plastic lens head lamps? **[5]**

Q6) a) Sketch any five road signs specifying dimensions and color code as per CMVR rule. **[5]**

b) As per CMVR describe the following procedure, **[5]**

i) Registration of motor vehicle.

ii) Insurance of motor vehicle against third part risk

Q7) Write short notes on the following (any two) **[10]**

a) Luminance meter and its principle.

b) Anthropometry data for automobile occupancy.

c) Role of seat belt in protection against whiplash injury.

d) Types of rear view mirrors.

Total No. of Questions : 7]

SEAT No. :

P4268

[Total No. of Pages : 2

[4860] - 1086

M.E. (Mech.) (Automotive Engg.)

ENGINE COMBUSTION TECHNOLOGY

(2013 Credit 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) ***All questions carry equal marks.***
5) ***Assume suitable data, if necessary.***

Q1) a) Fuel is supplied to engine has following composition on mass basis 85% carbon, 13% hydrogen, 2% oxygen. The air supplied is 60% in excess of that theoretically required for complete combustion. Estimate volumetric composition of dry flue gas. If temperature of flue gas is 330ºC and room temperature 15ºC, then estimate heat carried by exhaust gas. Assume specific heat of dry flue gas as 1.005 kJ/kg K. **[7]**

b) Define flammability limits with suitable sketches. **[3]**

Q2) a) Determine enthalpy of combustion of n-decane at 25º C and 1 atm. Using enthalpy of formation table data. Assume water in product is in liquid form. **[5]**

b) Write the basics of pre flame reactions. **[5]**

Q3) a) What is primary and secondary air in gas turbine combustion chamber? What are their functions. **[5]**

b) Discuss in brief performance characteristics of gas turbine combustion system. Illustrate your answer with suitable curve. **[5]**

P.T.O.

Q4) a) What is the A:f ratio used in gas turbine when the hot gas is supplied to turbine. Comment on the values mentioned. **[5]**

b) With the help of neat sketch describe the working of bluff body and swirling stabilizer. Discuss the advantages and disadvantages of each type. **[5]**

Q5) a) Define the terms flame development and flame propagation in engines. **[5]**

b) What is the effect of injection pressure on combustion. **[5]**

Q6) a) Compare DI and IDI engines. **[5]**

b) Explain the effect of various engine variables on SI engine knock. **[5]**

Q7) a) Explain with figures various types of combustion chambers used in CI engines. **[6]**

b) Compare induction swirl and compression swirl. **[4]**

Total No. of Questions : 5]

SEAT No. :

P4269

[Total No. of Pages : 2

[4860] - 1087

M.E. (Mechanical - Automotive Engineering)

NOISE VIBRATION AND HARSHNESS

(2013 Credit Pattern) (Semester - II) (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) ***Figures to the right indicates full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) Solve any **Two** questions:

a) Explain the principle of wave propagation. What do you mean by Transverse and Longitudinal sound waves? **[5]**

b) Explain the Octave Band analysis and their significance in NVH. **[5]**

c) The sound pressure level measured at 10 m from an automobile horn is 110 dB. Determine the sound pressure level at distance of **[5]**

i) 20m

ii) 80 m.

Assume that the inverse square law holds good between intensity and distance.

Q2) Solve any **Two** questions:

a) What are the Interior sources of noise in vehicle? **[5]**

b) Explain the effect of noise on human beings. **[5]**

c) Explain in detail different sound fields and state its significance. **[5]**

P.T.O.

Q3) Solve any **Two** questions:

a) Explain Pass by Noise measurement of Vehicle. **[5]**

b) Explain in detail Digital Signal Processing technique. **[5]**

c) Frequency spectrum analysis of the noise output of the machine using one-octave band pass filters gave the following results: **[5]**

Central frequency (in Hz)	125	250	500	1000	2000	4000	8000	16000
SPL (in dB)	70	71	84	86	85	77	64	66

Calculate the overall sound pressure level?

Q4) Solve any **Two** questions:

a) Explain Porous, Membrane, Cavity and Perforated Panal Absorber. **[5]**

b) Explain the working of Helmholtz resonator type Muffler. **[5]**

c) Explain construction and working principle of an Electrodynamic shaker. **[5]**

Q5) Writa a Short Note (**Any two**):

a) Sound intensity mapping. **[5]**

b) Single source structure-borne noise transmission path analysis. **[5]**

c) Anechoic chamber and Reverberation chamber. **[5]**

Total No. of Questions : 7]

SEAT No. :

P4270

[Total No. of Pages : 2

[4860] - 1088

M.E. (Mechanical - Automotive Engineering)

AUTOMOTIVE CHASSIS DESIGN

(2013 Credit Pattern) (502309) (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 indicates full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Explain the differences between coil spring, leaf spring and torsion bar with the help of neat sketches and explain their role in suspension system. **[5]**

b) A helically coiled spring of 40 N/mm stiffness has been used on a jeep. It is to be designed to sustain a maximum road load (jerk) of 1000N. If the allowable stress in the spring material is not to exceed 420 N/mm^2. Design the diameter of the wire and number of turns in it. Take modulus of rigidity of spring material as 84 GPa. **[5]**

Q2) a) Describe with neat sketch working of rack and pinion type and re-circulating ball steering mechanism. **[5]**

b) An auto vehicle of 2.875 m wheel base, 1.255 m front and rear wheel track has its pivot centers 1.155 m apart. If inside lock angle is 40 degree, calculate: **[5]**

i) Outside lock angle for pure rolling.

ii) Turning circle radius of outer for outer front wheel and inner rear wheel.

P.T.O.

Q3) a) A rear wheel driven car of mass 2000 kg and wheel base 1500 mm is moving up an incline of angle θ with the horizontal. Its CG lies 1000mm away from the rear wheel and 250 mm above the inclined road surface. Assuming that the friction acts on the rear wheels only and the coefficient of friction between tyres and the road is 0.3. Calculate the angle θ that car can climb. **[5]**

b) What factors do influence the braking efficiency and stopping distance of a moving vehicle? Explain. **[5]**

Q4) a) What is 'aspect ratio' of tyre? Low profile 70 aspect ratio tyres are more popular on passenger cars-why? Explain with suitable example. **[5]**

b) Sketch the constructional details of a heavy duty pneumatic tyre and explain role of elements in it. **[5]**

Q5) a) Explain with sketch layout of suspension system used in six wheel vehicles. **[5]**

b) Draw a neat diagram of a crawler tractor and explain the arrangement of power train and working of different parts. **[5]**

Q6) a) Differentiate between an articulated and rigid axle vehicle. How do their construction and design differ from each other? Explain. **[5]**

b) Draw a following layout of a chassis and explain advantages and disadvantages of it. **[5]**

i) Front engine rear wheel drive.

ii) Front engine front wheel drive.

Q7) Write short note on the following: (Any Two): **[10]**

a) Scammell articulated trailers.

b) Tyre retreading and manufacturing.

c) Power assisted brakes.

d) Double trailing link.

Total No. of Questions : 5]

SEAT No. :

P4271

[Total No. of Pages : 2

[4860]-1089

M.E. (Mechanical) (Automotive Engineering)

VEHICLE DYNAMICS

(2013 Credit Pattern) (602313) (Semester - III)

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

Instructions to the cadidates:

1) ***Attempt ALL questions.***
2) ***Figures to the right indicate full marks.***
3) ***All questions carry equal marks.***
4) ***Assume Suitable data, if necessary.***

Q1) Attempt any TWO.

a) Explain rolling resistance of tires. **[5]**

b) Describe ride performance of tires on wet surface. **[5]**

c) Compare Radial Ply tire for slip angle verses cornering force. **[5]**

Q2) Attempt any TWO.

a) Derive the equation for maximum tractive effort that the tire ground can support in terms of coefficient of road resistance. **[5]**

b) Write short notes on braking characteristics of two axle vehicle. **[5]**

c) Explain trans mission characteristics of vehicle power plant. **[5]**

Q3) Attempt any TWO.

a) Explain Significance of caster and kingpin angle. **[5]**

b) Find the geometry that would be necessary to achieve 100% anti-squat in the rear suspension and a geometry to achieve full anti pitch for the solid axle, rear wheel drive vehicle described below. Also find the pitch rate when the geometry is set for 100% anti-squat in rear suspension. The front and rear suspension spring rates are 285 and 11b/in respectively. The CG height is 18.5 inches and wheel base is 104. **[5]**

c) Explain steering force and moments. **[5]**

P.T.O.

Q4) Attempt any TWO.

a) Describe steering of tracked vehicle. **[5]**

b) Explain the transient response characteristics of vehicle. **[5]**

c) Sketch and explain the handling behavior of car with and without vehicle stability control system. **[5]**

Q5) Attempt any TWO.

a) Write short notes on auto-correlation function. **[5]**

b) Explain the concept of active and semi active suspension with neat sketch. **[5]**

c) Explain the effect of wheelbase in suspension modeling. **[5]**

x x x

Total No. of Questions : 8] **SEAT No. :**

P4592 **[Total No. of Pages : 2**

[4860] - 1090
M.E. (Mechanical) (Automotive Engineering) (Semester - III)
AUTOTRONICS
(2013 Credit Pattern)

Time : 2 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Answers any five questions.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of electronic pocket Calculator is allowed.***
4) ***Assume Suitable data if necessary***

Q1) a) Explain working of Computerized Engine control system **[6]**

b) Write a note on Variable Valve Timing **[4]**

Q2) a) What is meant by Multi-point Fuel Injection System? **[5]**

b) Explain Emission Control Norms in Automotive **[5]**

Q3) a) Explain construction and working of Downstream and Upstream cooling Air conditioning System **[4]**

b) Explain use and its working of thermostatic expansion valve in air conditioning system **[6]**

Q4) a) Explain Lighting System in Automotive **[6]**

b) Explain DTC (Diagnostic Trouble Codes) **[4]**

Q5) a) Explain Driver and Passenger Comfort Systems **[4]**

b) Explain working of ABS System **[6]**

P.T.O.

Q6) a) Write a note on Rollover Mitigation System **[5]**

b) Explain Electronic Stability Program System Operation **[5]**

Q7) a) Explain working of Air Bag System **[6]**

b) Explain importance of Belt Tensioner in terms of Safety of Passenger **[4]**

Total No. of Questions : 7]

SEAT No. :

P4272

[Total No. of Pages : 2

[4860]-1092

M.E. (Mechanical - Energy Engineering)

ADVANCED THERMODYNAMICS

(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 side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Law of corresponding states. **[5]**

b) Discuss the generalised compressibility chart with suitable diagram? **[5]**

Q2) a) Explain the phase change process from solid to gas with P-V, T-S and P-T diagram for a substance which shrinks in volume on melting and also for a substance which expands in volume on melting. **[5]**

b) Explain Critical point and triple point of water with sketch. **[5]**

Q3) Write a note on

a) Increase in entropy principle and entropy generation. **[5]**

b) Availability and Irreversibility. **[5]**

Q4) a) Write a note on Maxwell relations. **[5]**

b) Prove that **[5]**

$$(Cp)) = \left(\frac{dh}{dT}\right)p = c \text{ and } (Cv)) = \left(\frac{du}{dT}\right)v = c$$

Q5) a) Explain enthalpy of reaction with example. **[3]**

b) Determine the adiabatic flame temperature for stoichiometric butane- air mixture at 298K, 0.1MPa assuming no dissociation of the products. **[7]**

Species	Heat of formation (kJ/kmol)	Specific Heat Cp at 1200 K(kJ/kmol.K)
C_4H_{10}	-124700	--
CO_2	-393546	56.21
H_2O	-241845	43.87
N_2	0	33.71

P.T.O.

Q6) a) Discuss theAmagat's Law and Kay's Rule. **[5]**

b) As applied to statistical thermodynamics, explain the principle of equipartition of energy. **[5]**

Q7) a) Explain The enthalpy of reaction with suitable example. **[5]**

b) Discuss the criteria for chemical equilibrium. Derive the relation between Gibb's Function and equilibrium constant? **[5]**

x x x

Total No. of Questions : 8]

SEAT No. :

P4273

[Total No. of Pages : 2

[4860]-1095

M.E. (Mechanical - Energy Engineering)

ADVANCED HEAT TRANSFER

(2013 Credit pattern) (502107) (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) Derive the generalized heat conduction equation in spherical co-ordinates? **[10]**

Q2) A plane wall 90 mm thick (k=0.18 W/m-deg.C) is insulated on one side while the other side is exposed to atmosphere at 80 deg. C. The rate of heat generation within the wall is 1.3×10^5 W/m^3.If the convective heat transfer coefficient between the wall and the atmosphere is 520 W/m^2-deg.C, determine the maximum temperature to which the wall will be subjected. **[10]**

Q3) The temperature of a gas stream is to be measured by a thermocouple whose junction can be approximated as a 1-mm-diameter sphere. The properties of the junction are k = 35 W/m.^{o}C, density=8500kg/m^3, and Cp = 320 J/kg.^{o}C, and the convection heat transfer coefficient between the junction and the gas is h = 210 W/m^2.^{o}C. Determine how long it will take for the thermocouple to read 99 percent of the initial temperature difference. **[10]**

Q4) a) Draw velocity boundary layer and thermal boundary layer for flow through tubes and flow over plate. **[6]**

b) Explain significance of any four dimensionless numbers in convection. **[4]**

Q5) a) Using dimensional analysis establish a relation between Nusselt, Prandtl and Grashof numbers. **[4]**

b) Explain filmwise and dropwise condensation. **[6]**

Q6) a) An enclosure measures 1.5m ×1.7m with a height of 2m. The walls and ceiling are maintained at 250 ^{o}C and the 130 ^{o}C. The wall and ceiling have an emissivity of 0.82 and the floor 0.7. Determine the net radiation to the floor. **[7]**

P.T.O.

b) Define: **[3]**

i) Absorptivity.

ii) Reflectivity.

iii) Transmissivity.

Q7) a) Find the shape factor of cylindrical cavity of diameter d and depth H with respect to itself. If d = 200mm, H = 500mm, T1 = 600K and ε_1=0.8, find the rate at which energy streams out from the cavity. **[6]**

b) What is pool boiling? How forced convection boiling different from pool boiling? **[4]**

Q8) A metal plate 0.609m in height forms the vertical wall of an oven and is at a temperature of 171 ^{o}C. Within the oven is air at a temperature of 93.4 ^{o}C and atmospheric pressure. Assuming that natural convection conditions hold near the plate and that this case

$Nu = 0.548(Gr.Pr)^{1/4}$

Find the mean heat transfer coefficient and the heat taken up by air per second per meter width. For air at 132.2 ^{o}C, take k = 33.2 × 10^{-6} kW/mK, $\mu = 0.232 \times 10^{-4}$ kg/ms, Cp = 1.005kJ/kgK. Assume air as an ideal gas and R = 0.287 kJ/kgK. **[10]**

x x x

Total No. of Questions : 8]

SEAT No. :

P4274

[Total No. of Pages : 2

[4860]-1096
M.E. (Mechanical - Energy Engineering)
ENERGY CONVERSION SYSTEMS
(2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

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

Q1) a) Describe procedures for measurement of moisture, measurement of volatile matter, measurement of ash content in the coal. **[6]**

b) Write classification of energy sources. **[4]**

Q2) The following particulars refer to a stage of a Parson' s steam turbine comprising one ring of fixed blades and one ring of moving blades; Mean diameter of blade ring = 70cm, R.P.M. = 3000,Steam velocity at exit of the blades 160 m/s, Blade outlet angle = 20^{o},Steam flow through blades = 7kg/s.

Draw the velocity diagram and find the following **[10]**

a) Blade inlet angle.

b) Tangential force on the ring of moving blades.

c) Power developed in a stage.

Q3) a) List a few energy efficiency improvement options in a refrigeration plant.**[4]**

b) Explain any two compressors with their applications used for refrigeration system. **[6]**

Q4) a) Explain the operating principle of a waste heat recovery boiler with examples. **[6]**

b) Explain the operating principle of a heat pump with examples. **[4]**

P.T.O.

Q5) a) Explain capacity of the compressor and various efficiencies of the compressor. **[5]**

b) Define various components of the compressed air system. **[5]**

Q6) a) Describe advantages of adopting Diesel power plants. **[4]**

b) Energy Saving Opportunities in Cooling Towers. **[6]**

Q7) Explain in detail any two methods to improve the efficiency of gas turbine power plant with cycle analysis. **[10]**

Q8) a) Explain design procedure of Francis turbine. **[5]**

b) Explain working proportions for Pelton turbine. **[5]**

x x x

Total No. of Questions : 8]

SEAT No. :

P4275

[Total No. of Pages : 1

[4860]-1097

M.E. (Mechanical Engineering) (Energy Engineering)

ENERGY MANAGEMENT

(2013 Credit Pattern) (502509) (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 right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain need of energy managenent. **[5]**

b) Explain the Scope of the Energy Management System. **[5]**

Q2) What are the three phases of energy audit and explain in detail each phase. **[10]**

Q3) a) Enlist the types of stream trappers and explain anyone of it's with a neat sketch. **[6]**

b) Explain Types of thermal insulation materials. **[4]**

Q4) a) Explain in detail the energy efficiency improvements in Energy efficient motors. **[5]**

b) What are the types of lamps used in lighting system? Write down their features with typical applications. **[5]**

Q5) a) Give details on the working principle of recuperators with diagram. **[5]**

b) Explain with diagram cogeneration systems using the back-pressure turbine. **[5]**

Q6) a) Explain in brief the Management of Spent Fuel. **[5]**

b) Explain Fundamental processes for the evaluation of waste management systems. **[5]**

Q7) What are roles of energy manager and energy auditor in energy management program. **[10]**

Q8) Write a short note on (any two): **[10]**

a) Energy conservation plan for a diary.

b) Power factor improvement and benefits.

c) Heat pipe.

x x x

Total No. of Questions :7]

SEAT No :

P4276

[Total No. of Pages : 2

[4860] - 1098

M.E. (Mechanical) (Energy Engineering)

NUCLEAR MATERIALS AND REACTOR FUNDAMENTALS

(2013 Coures) (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) Plot the radioactive decay curve for nitrogen- 16 over a period of 100 seconds. The initial activity is 142 curies and the half-life of nitrogen- 16 is 7.13 seconds. Plot the curve on both linear rectangular coordinates and on a semi-log scale. **[6]**

b) Why uranium-235 fissions with thermal neutrons and uranium-238 fissions only with fast neutrons? Explain in detail. **[4]**

Q2) a) Describe the following scattering interactions between a neutron and a nucleus: **[6]**

i) Elastic scattering.

ii) Inelastic scattering.

b) Explain the hardening and embrittlement of nuclear materials due to exposure of nuclear radiations. **[4]**

Q3) a) Why only the heaviest nuclei are easily fissioned?. Explain in detail. **[5]**

b) Describe the curve of Binding Energy per Nucleon versus mass number and give a qualitative description of the reasons for its shape. **[5]**

Q4) a) Explain the following processes of nuclear fuel enrichment. **[6]**

i) Gaseous diffusion.

ii) Centrifuge process.

P.T.O.

b) Define the following terms: (Any two) **[4]**

i) Fissile material.

ii) Fissionable material.

iii) Fertile material.

Q5) a) Explain the moderators used in the nuclear reactor. **[5]**

b) What is In-situ leaching? Explain in detail. **[5]**

Q6) a) How nuclear fuel rods are manufactured? Explain in detail. **[5]**

b) Differentiate between Boiling water reactor (BWR) Pressurized heavy water reactor (PWR) with neat sketch. **[5]**

Q7) Describe the following reactions where a neutron is absorbed in a nucleus: **[10]**

a) Radioactive capture.

b) Particle ejection.

Total No. of Questions :8]

SEAT No :

P4277

[Total No. of Pages : 2

[4860] - 1099

M.E. (Mechanical) (Energy Engineering)

ENERGY SYSTEMS MODELLING AND ANALYSIS

(2013 Credit Pattern) (602514) (Semester -III)

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

Instructions to the candidates:

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

Q1) a) Explain information flow diagram with suitable example. **[6]**

b) Write short note on components of system. **[4]**

Q2) a) Fit a straight line to the *x* and *y* values in the first two columns of Table. **[6]**

X_i	Y_i
1	0.5
2	2.5
3	2.0
4	4.0
5	3.5
6	6.0
7	5.5

b) Write short note on analog models with an example. **[4]**

Q3) a) Write short note on discrete event system simulation. **[4]**

b) Explain in details steps involved in simulation study. **[6]**

P.T.O.

Q4) Maximize: $Z = 2x_1 + x_2$. By using Graphical Method. **[10]**

Subject to: $x_1 + 2x_2 \leq 10$

$x_1 + x_2 \leq 6$

$x_1 - x_2 \leq 2$

$x_1 - 2x_2 \leq 1$

$x_1, x_2 \geq 0$

Q5) For a heating system, the objective function U(x) is the heat delivered per unit energy consumed. The independent variable x represents the temperature setting and has an initial range of 0 to 8. A maximum in U is desired to operate the system most efficiently. The objective function is given as $U(x) = 7 + 17x - 2x^2$. Obtain the optimum using the Fibonacci search method. **[10]**

Q6) In a system for providing hot water for industrial use, the heating unit has a power input of 150 kW and a thermal efficiency of $100(0.2 + 0.045T^{0.5})$, in percent, where T is the operating temperature in degrees centigrade. The rate of heat loss to the environment, in kW, is represented by the expression 0.12Tl.25. Formulate the optimization problem to maximize the rate of energy supplied to the industry and obtain the optimum by using geometric programming. Also, solve the problem by minimizing the energy loss and show that the results obtained are the same as before. **[10]**

Q7) Write the proof of Lagrange multiplier method? **[10]**

Q8) Explain Monte Carlo simulation. **[10]**

Total No. of Questions : 7] **SEAT No. :**

P4593 **[Total No. of Pages : 3**

[4860] - 1101
M.E. (Mechanical (CADME)
ADVANCED MACHINE DESIGN
(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronics pocket calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Derive the compatibility equations in Polar co-ordinate system. **[5]**

b) Investigate the validity of stress function **[5]**

$$\phi = \left[C_1 r^4 + C_2 r^2 + C_3 + \frac{C_4}{r^2} \right] \text{ Cos } 2\theta$$ Where r and θ are polar coordinates.

Q2) a) Explain the following theories of failures with graphical representation and applications **[6]**

i) Von misses

ii) Octave

b) Investigate what problem of plane stress is represented by the function

$$\phi = \frac{3F}{4h}\left(xy - \frac{2Ry^3}{3h^2} \right) + \frac{P}{2} y^2$$

Where 'h' is half depth of beam, and 'F' as the concentrated load **[4]**

Q3) a) State and explain the theorem of virtual work and theorem at least work.

Apply these theorems to find out the deflections at the free end at a cantilever beam of length 'L' subject to vertical load 'P' at the free end. **[10]**

P.T.O.

Q4) a) A cantilever beam has a rectangular cross-section 5cm wide and 9cm deep. The length of beam is 200 cms with a lood of 12000N. on it at the end. The material is carbon steel with $\eta = 7$ and B = 40×10^{-39} $\left(cm^2 / N\right)^{\eta}$ day. Find permanent deflection after 10 years. **[4]**

b) A cold drawn steel rod of circular cross section is subjected to a variable bending moment which varies from 565 N-m to 1130 N-m, as the axial load varies from 4500 N to 13500 N. The maximum bending moment occurs at the same instant that the axial load is minimum. The effect of stress concentration may be neglected. If the factor of safety is '2', determine the diameter of rod using maximum shear stress theory. Assume the following data. **[6]**

S_{ut} = 550 N/mm^2; S_{yt} = 470 N/mm^2

surface finish factor = 0.82

Size factor = 0.8, Reliability factor = 0.897

Q5) a) Write short note on Transverse shear effect in composite laminates **[5]**

b) What is true stress and true strain? Assuming exponential relation for true stress and true strain, derive the expression to estimate time of rupture.**[5]**

Q6) a) Write short note on Surge in springs. **[4]**

b) A disc spring is made of 3mm sheet with an outside diameter of 125mm and an inside diameter of 50mm. The spring is dished 4.5mm. The maximum stress is to be 560N/mm^2. Determine : **[6]**

i) The load that may be safely carried.

ii) The deflection at this load.

iii) Stress produced at outer edge.

Q7) a) What is Belleville spring? What are the advantages and applications of Belleville spring **[4]**

b) Two 10 teeth gears are to mesh without undercutting. The gears are generated using standard nob with 20º pressure angle. Module is 4 mm, the clearance is 0.2 mm. Using extended centre distance method find out, **[6]**

i) Hob shift.

ii) Blank diameter & depth of cutter setting.

iii) Actual pressure angle.

Take usual notations;

$$\theta = \text{inv}\phi$$

$$\phi = v - \frac{2}{15}v^3 + \frac{3}{175}v^5$$

where, $v = \sqrt[3]{3\theta}$

θ & ϕ are in radians.

Total No. of Questions :7]

SEAT No :

P4278

[Total No. of Pages : 2

(4860) - 1102
M.E. (Mech. Engg.) (CADME)
COMPUTER AIDED DESIGN
(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Answer any 5 questions from below.***
2) ***Figures to the right indicate full marks.***
3) ***All questions carry equal marks.***
4) ***Assume Suitable data, if necessary.***

Q1) Represent Bezier Curve with mathematical equation and graphically. Explain Cubic Spline Curve and Bezier Curve with its applications. **[10]**

Q2) Suggest the procedure that you will adopt to create. **[10]**

a) Air conditioning duct

b) Surface of revolution

Q3) How do you obtain orthographic projection of 3D geometric database? A cube of length 10 units is having one of its corners at the origin (0,0,0) and the three edges along the three principle axis. If the cube is to be rotated about Z axis by an angle of 30^0 in counter clockwise direction, calculate next position of cube. **[10]**

Q4) With Basic Elements and Building Operations represent B-rep or CSG. Compare IGES and PDES with its features. **[10]**

Q5) What are different visibility techniques? Explain Minimax test and Containment test with example of polygon. **[10]**

P.T.O.

Q6) What is collaborative design? What are its principles, approaches and tools? Comment with industrial application. **[10]**

Q7) Write a brief note on **[10]**

a) Generic hidden line algorithm.

b) Feature recognition.

Total No. of Questions : 7]

SEAT No. :

P4636

[Total No. of Pages : 1

[4860] - 1104

M.E. (Mechanical) (Computer Aided Design, Manufacturing & Engineering)

COMPUTER INTEGRATED MANUFACTURING

(2013 Pattern)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any five questions from following.***
2) ***Figures to the right indicate full marks.***

Q1) Identify and describe three process segments in CIM enterprise area. **[10]**

Q2) How database is arranged in dbms? What are its different structures? **[10]**

Q3) In MRP which type of database is required? How MPS affects on MRP? **[10]**

Q4) What are steps in web based manufacturing? How it is applied in field of forming or machining or casting? **[10]**

Q5) Explain: i. Cellular manufacturing: Technology steps with application. ii. Agile manufacturing: Technology and future scope **[10]**

Q6) Explain lean manufacturing, technology, its characteristics and its use for specific product. **[10]**

Q7) What are performance measures and functions performed in lean production? **[10]**

● ● ●

Total No. of Questions : 7]

SEAT No :

P4279

[Total No. of Pages : 1

[4860] - 1105

M.E. (Mechanical Engineering) (CADME)

INDUSTRIAL PRODUCT DESIGN & PRODUCT LIFECYCLE MANAGEMENT

(2013 Credit Pattern) (Semester -II)

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

Instructions to the candidates:

1) ***Answer any five questions from the following.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) Explain four phases of QFD approach with example? **[10]**

Q2) Explain Best practices for product development with example? **[10]**

Q3) Explain DFMA with different approaches? **[10]**

Q4) What is the impact of DFM on development cost & Product quality? **[10]**

Q5) Explain with example teardown method? **[10]**

Q6) State & explain different characteristics of PLM? **[10]**

Q7) Define PDM, explain architectures of PDM system. **[10]**

Total No. of Questions : 7] **SEAT No. :**

P4667 **[Total No. of Pages : 2**

[4860]-1106

M.E. (Mechanical) (CADM&E)

AUTOMATED MANUFACTURING SYSTEM MODELING

(2013 Pattern) (Semester - II)

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

Instructions to the candidates:

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

Q1) What is the need of modeling of Manufacturing Systems? What are Performance Measures? Elaborate. **[10]**

Q2) Explain with suitable example Discrete and Continuous Time Markov Chain Models. **[10]**

Q3) What are different elements of Flexible Manufacturing Systems? Explain in detail. **[10]**

Q4) What are Birth and Death Processes in Manufacturing? Explain with suitable case study. **[10]**

Q5) Describe Batch Arrival Queuing Systems for Machining Shop. Develop case study and explain. **[10]**

P.T.O.

Q6) Describe in detail Integrated PRQN-GSPN Model. **[10]**

Q7) Explain Semi-Markov Processes in Manufacturing. **[10]**

Total No. of Questions : 7] SEAT No. :

P4650 [Total No. of Pages : 1

[4860] - 1107

M.E. (Mechanical) (CADM and E) (Semester - III)

SIMULATION MODELING

(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) Describe working of discrete and continuous systems with appropriate example and mathematical models. **[10]**

Q2) Describe additive congruential method and linear congruential method for Random number Generation. **[10]**

Q3) Describe Model building for Vertical Machining Centre using any of the simulation platform approach. How the model will be validated? Explain. **[10]**

Q4) Explain Empirical continuous distribution and geometric distribution with suitable example. **[10]**

Q5) Explain Kolmogorov Smirnov test and the chi square test for simulation in detail. **[10]**

Q6) What is necessity of verification and validation of model? Explain variance reduction techniques with suitable case study. **[10]**

Q7) With suitable engineering example describe single channel queue and two server queue. **[10]**

Total No. of Questions : 7] SEAT No. :

P4660 [Total No. of Pages : 2

[4860]-1108
M.E. (Mechanical) (CADM&E)
OPTIMIZATION TECHNIQUES
(2013 Pattern) (Semester - III)

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

Instructions to the candidates:

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

Q1) Elaborate Selection, Crossover and Mutation in genetic Algorithm in detail. How probability are importance in GA? Why it is termed as systematic yet random approach? **[10]**

Q2) Minimize :

$$F = 20\ X_1 + 16X_2 \quad \text{subject to} \quad X_1 \geq 2.5 \quad X_2 \geq 6$$

$$2X_1 + X_2 \geq 17 \quad X_1 + X_2 \geq 12 \quad \text{and } X_1 \geq 0 \quad X_2 \geq 0$$

Using Dual Simplex method. **[10]**

Q3) Explain different Optimality criteria for Single Objective, Multi Objective and Constrained Optimization Problems. **[10]**

Q4) Solve by using Secant Method $F(X) = X^2 + (54/X)$. **[10]**

Q5) Define Constraint. Explain Penalty function approach. What is Pareto Optimality in Multi Objective Optimization? **[10]**

P.T.O.

Q6) Minimize using Cutting Plane Method : **[10]**

$$170 - 14X_1 - 22X_2$$

Subject to $G_1(X) = 26 - (X_1 - 5)^2 - X_2^2 \geq 0$

$G_2(X) = 20 - 4X_1 - X_2 \geq 0$ and $X_1, X_2 \geq 0$

Q7) Describe briefly Simulated Annealing and Particle Swarm Algorithm. **[10]**

Total No. of Questions : 8]

SEAT No :

P4280

[Total No. of Pages : 2

[4860] - 1109

M.E. (Electrical Control System)

COMPUTATIONAL TECHNIQUES FOR CONTROL SYSTEMS

(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Answers Qu 1 or 2, Qu 3 or 4, Qu 5 or 6, Qu 7 or 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain what do you understand by Lagrange Function. **[5]**

b) Explain what do you understand by relative and global maximum. **[4]**

OR

Q2) Use analytical method to investigate for extremum point. **[9]**

$$f(x) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$$

Q3) Use analytical method to investigate for extremum point. **[9]**

$F(x) = -3x^4 + 10x^3 - 20.$

OR

Q4) Explain what do you understand by Multivariable Optimization with no constraint. Write necessary and sufficient condition. **[9]**

Q5) Write & Explain Simplex method for solving LPP. **[16]**

OR

Q6) Explain the concept of suboptimization and principle of optimality used in multistage decision problem. **[16]**

P.T.O.

Q7) a) Explain the Gomory's cutting plane method. **[8]**

b) Explain the integer nonlinear programming. **[8]**

OR

Q8) Minimize $f = -3x_1 - 4x_2$ **[16]**

Subject to $3x_1 - x_2 + x_3 = 10$

$3x_1 + 11x_2 + 2x_4 = 64$

$x_i \geq 0$, i = 1 to 4 and x_i is integer.

Total No. of Questions : 6]

SEAT No. :

P4281

[Total No. of Pages : 2

[4860]-1110

M.E. (Electrical - Control System)

PROCESS CONTROL MANAGEMENT

(2013 Credit Pattern) (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 stress management 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 the block diagram of digital control system. **[6]**

Q3) a) Compare P, P1, and PID control action in detail. **[8]**

b) Explain cascade control system for Continuous Stirred Tank Reactor. **[8]**

OR

Q4) a) Give the steps to develop a discrete time model from its equivalent continuous time model. **[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) Describe the relative Gain Array for a process with two inputs and two outputs. **[8]**

b) Explain the effect of interaction on stability of process control system. **[8]**

OR

Q6) a) Explain interaction of control loops in a stirred tank heater for temperature control with suitable diagram. **[8]**

b) Explain how you can use the RGA to select the loops with minimum interaction. **[8]**

Total No. of Questions : 6]

SEAT No. :

P4282

[Total No. of Pages : 2

[4860]-1111

M.E. (Electrical) (Control Systems)

NON LINEAR CONTROL SYSTEM

(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

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

Q1) a) What is mean by non linear control system? Discuss classification of nonlinear control system with suitable examples. **[5]**

b) How can stability be derived using describing function ? Discuss it with suitable example. **[4]**

c) Using Isocline method draw phase plane trajectory of second order **[5]**

$$\frac{d^2x}{dt^2} + 4\frac{dx}{dt} + 5x = 0$$

Taking starting points as $\dot{x} = 1.5,\ x = 0$

d) Dervie discribing function of ON- off relay with dead zone. **[4]**

OR

Q2) a) Explain different singular points for non- autonomous system. **[4]**

b) Explain delta method of constructing a phase plane trajectory for a given system. **[6]**

c) Explain the following for absolute stability: **[6]**

i) Circle criterion.

ii) Popov criterion.

d) Explain Terms: **[2]**

i) Phase plane.

ii) Isocline.

iii) Trajectory.

iv) Phase portrait.

P.T.O.

Q3) a) Explain Krasovsikii method for determination of Liapunov function. **[8]**

b) Select Liapunov function and determine stability. **[8]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}.$$

OR

Q4) a) The system equations are given below. **[8]**

$$\dot{x}_1 = 2x_2,\ \dot{x}_2 = -x_1 - 3x_2 .$$

Select $V = 2x_1^2 + x_2^2$ as Liapunov function and determine stability.

b) Explain Liapunov's direct method and its mathematical representation for stability determination. **[8]**

Q5) a) Explain feedback linearization. **[6]**

b) Explain any nonlinear control system design using sliding mode technique. **[10]**

OR

Q6) a) Explain the terms: **[6]**

i) Sliding phase.

ii) Reaching phase.

iii) Chattering as used in sliding mode control.

b) Determine the sliding dynamics along sliding set for the system. **[10]**

$$\dot{x}_1 = -2x_1 - x_2 + sign\,(-x_1 - x_2)$$

$$\dot{x}_2 = x_1 .$$

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Total No. of Questions : 6]

SEAT No. :

P4283

[Total No. of Pages : 2

[4860]-1112

M.E. (Electrical) (Power Systems/Control 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) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) What do you mean by research ? Explain its significance in modern times. **[5]**

b) Describe the techniques of defining a research problem. **[5]**

c) Explain in short the meaning of research design. **[4]**

d) Discuss interview as the technique of data collection. **[4]**

OR

Q2) a) Distinguish between research methods and research methodology. **[5]**

b) Discuss steps involved in selecting a research problem. **[5]**

c) List the features of good research design. **[4]**

d) Write short note on measures of dispersion. **[4]**

Q3) a) Describe the layout of research report covering all relevant points. **[8]**

b) Explain the usefulness of Latex in technical report writing. **[8]**

OR

P.T.O.

Q4) a) Explain the technique and importance of oral presentation of research finding. **[8]**

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

i) Characteristics of good research paper and

ii) Bibliography and its importance in the context of research report.

Q5) a) Explain clearly the difference between conference paper and journal paper. **[8]**

b) Write short note on trade related aspects of IPR. **[8]**

OR

Q6) a) Write short note on layout of research project proposal. **[8]**

b) Discuss different types of technical papers. **[8]**

Total No. of Questions : 6]

SEAT No. :

P4284

[Total No. of Pages : 2

[4860]-1113

M.E. (Electrical) (Control Systems)

MULTIVARIABLE AND OPTIMAL CONTROL SYSTEM

(2013 Credit 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) For feed back control system with forward Transfer function **[5]**

$$G(s)=\begin{bmatrix} \frac{1}{s} & \frac{1}{s+1} \\ \frac{1}{s+2} & \frac{1}{s} \end{bmatrix}$$

and unity feed back find.

i) State space representation.

ii) Over all transfer function/transfer Matrix.

b) Explain full state controllability and observability for multivariable control system. **[4]**

c) Explain with neat diagram state estimation problem using observer. **[5]**

d) Explain

i) Decoupling or Non- iteractive control .

ii) Model matching control.

For Multivariable control systems. **[4]**

OR

Q2) a) Explain the representation. **[4]**

i) Transfer Matrix form.

ii) State space form.

b) Determine observability and controllability for

P.T.O.

$$A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 1 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

of multivariable system. **[5]**

c) Why is pole allocation needed? Explain with block diagram Linear state variable feed back in Multivariable control system. **[5]**

d) Derive performance Index for optimal control of **[4]**

i) Minimum Time problem.

ii) Tracking problem.

Q3) a) Discuss any one method for numerical solution of Matrix Riccati Equation. **[8]**

b) Define Hamiltonian. Discuss the procedure for solving the optimal control problem using Hamilton method. **[8]**

OR

Q4) a) Apply pontraygin's optimal policy for system **[8]**

$$J = \int_0^1 \left(x^2 + u^2 \right) d\,t$$

$\dot{x} = -x + u$ where u is input.

b) State the pontryagin's minimum principle. Discuss relationship between dynamic programming and pontryagin's minimum principle. **[8]**

Q5) a) Using minimum principle show that it is necessary to use Bang- bang control to drive the system. **[8]**

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

From (1,1) to (0,0) if input variable is constrained as $-1 \le u \le 1$.

b) Explain in detail the minimum time optimal control problem. **[8]**

OR

Q6) a) Explain Bang- bang control and it's merit. **[8]**

b) Explain singular control solution. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P4285

[Total No. of Pages : 2

[4860]-1114

M.E. (Electrical Control Systems)

SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL

(503108) (2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Q3 and Q6 are compulsory.***
2) ***Figures to the right indicate marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) With the help of a neat diagram explain the procedure for system identification. **[4]**

b) Compute the QR factorization of the matrix. **[6]**

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

OR

Q2) a) For a model given by $y = \Phi\theta$, Derive the least square estimate of θ. **[4]**

b) What do you understand by persistently exciting signal? What is the order of the following signals. **[6]**

i) White noise.

ii) Step signal.

iii) Sum of Sinusoids.

Q3) Write notes on any four: **[8]**

a) Pattern Recognition.

b) Learning without supervision.

c) Recursive Estimation.

d) Maximum Likelihood Method.

e) Model structure.

f) Bayesian Learning

P.T.O.

Q4) a) With the help of a block diagram explain the working of self- tuning regulator. **[8]**

b) Explain the pole placement design and derive the Diophantine equation. **[8]**

OR

Q5) a) Prove the Matrix Inversion Lemma: $[A+BCD]^{-1} = A^{-1} - A^{-1} B [C^{-1} + D A^{-1} B]^{-1} D A^{-1}$. **[6]**

b) What are the various adaptive schemes and how are they implemented? **[10]**

Q6) Using both the MIT rule and Lyapunov theory, design an MRAS for a systemdescribed by

$G(s) = \dfrac{b}{s+a}$, where *a* and *b* are unknown.

The controller is given by $u(t) = \theta_1 u_c(t) + \theta_2 y(t)$, and the desired closed loop model is $\dfrac{dy_m}{dx} = -a_m Y_m + b_m u_c$. Draw the simulation diagram and compare the two methods.

Assume $V(\theta) = \dfrac{1}{2}\left[e^2 + \dfrac{1}{b\gamma}(b\theta_2 + a - a_m)^2 + \dfrac{1}{b\gamma}(b\theta_1 - b_m)^2 \right]$. **[16]**

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Total No. of Questions : 3]

P4286

SEAT No. :

[Total No. of Pages : 2

[4860]-1115

M.E. (Electrical) (Control System)

ADVANCED DIGITAL CONTROL TECHNIQUES

(2013 Credit Pattern) (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) What are different methods of digital modeling? Explain numerical integration method in detail.

b) For the system with pulse transfer function,

$$G(Z) = \frac{(Z+1)}{(Z^2+1.3Z+0.4)};$$

Draw state diagram and obtain state model by parallel digital programming method.

c) Discuss effect of pole zero cancellation on system with proper example.

d) Explain decimation and interpolation process with the help of spectral analysis.

e) Write a short note on digital PID controller.

Q2) Solve any two. **[16]**

a) State and explain key features of TMS 320 C5X processor.

b) What is fixed point and floating point DSP ?

c) Explain the concept of instruction pipeline.

d) Discuss effect of finite word length in digital filters.

P.T.O.

Q3) Solve any two. **[16]**

a) Explain different addressing modes of TMS320C54X.

b) Give functional block diagram of TMS320C54X.

c) What are the applications of TMS 320 typical DSP processor ?

d) Explain in detail function of discrete wavelet transform in digital system.

Total No. of Questions : 6]

SEAT No. :

P4594

[Total No. of Pages : 2

[4860] - 1116

M.E. Electrical (Control System)

ADVANCED DRIVES AND CONTROL

(2013 Credit Pattern) (Semester - III)

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

Instructions to the candidates:

1) ***All questions are compulsory.***

2) ***Figures to right indicate full marks.***

Q1) a) Write a note on" Matching of Power Electronics Controller and electric motor to drive its load". **[5]**

b) Write in detail about torque pulsation in separately excited d.c. motor supplied from solid state controllers. **[4]**

c) Write in detail about necessity of derating of induction motor fed from inverter. **[5]**

d) Write a note on Dynamic D-q model in connection with speed control of induction motor. **[4]**

OR

Q2) a) Explain steady state operation of the drive .Proove the steady state stability criterion. **[4]**

b) With neat diagram, explain system model and derive the transfer function of the converter fed D.C.motor. **[5]**

c) Write a note on Pulse Width Modulated inverter. **[4]**

d) Explain static krammer control of drive using induction motor. **[5]**

Q3) Explain in detail with reference to synchronous motor drive

a) Trapezoidal SPM drive. **[8]**

b) Sinusoidal SPM drive. **[8]**

OR

P.T.O.

Q4) Write a note on :

a) Switched Reluctance motor drive. **[8]**

b) Wound field machine drive. **[8]**

Q5) a) Write a note on modern trends in electric drives control. **[8]**

b) Explain the working principle of Phase locked loop (PLL) system and discuss the application of PLL in the closed loop controlled drives **[8]**

OR

Q6) Explain in detail the role of following in the closed loop control system of the electrical drive.

a) PI controller. **[8]**

b) PID controller. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P4595

[Total No. of Pages : 2

[4860] - 1117

M.E. (Electrical) (Control System)

COMPUTER AIDED CONTROL SYSTEM DESIGN

(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicates 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]**

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]**

$$\dot{x}(t) = Ax(t) + Bu(t)$$

$$y(t) = Cx(t)$$

With usual notation. Give its algorithm.

b) Draw the block diagram of observer system and explain with the designing steps of full order observe. **[4]**

c) Explain 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 – Nicol's 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 $z = 0.5 + j\,0.5$, $z = 0.5 - j\,0.5$. **[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 $n \times 1$ state vector, $u(k)$ is $m \times 1$ control vector, F and G are constant matrices of compatible dimensions. Explain the computer method for obtaining closed loop system response. Draw flow chart and give its algorithm. **[8]**

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Total No. of Questions : 3]

SEAT No. :

P4287

[Total No. of Pages : 2

[4860]-1118

M.E. (Electrical) (Power Systems)

COMPUTER APPLICATIONS IN POWER SYSTEMS

(2013 Credit Pattern) (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) Minimise $f(x) = x_1^2 - x_2^2$ subjected to $g(x) = x_1 x_2 - 1 = 0$ using direct substitution method.

b) Minimize $f(x) = x_1^2 - x_2^2 - 2x_1 + x_1x_2 + 1$ using classical optimization method.

c) Derive the equation used in three phase load flow analysis.

d) Explain contingency analysis and security monitoring used in power system 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

$$P_L = 0.001P_{G1}^2 + 0.002P_{G_2}^2 - 0.0004P_{G1}P_{G2}$$

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) Explain solution economic load dispatch problem using Newton-Raphson method.

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.

Total No. of Questions : 7]

SEAT No. :

P4288

[Total No. of Pages : 2

[4860]-1119

M.E. Electrical (Power Systems)

POWER SECTOR ECONOMICS AND MANAGEMENT

(2013 Credit Pattern)(Semester -I)

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

Instructions to the candidates:

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

Q1) a) Explain necessity of deregulation in power sector. **[6]**

OR

b) Explain role of planning commission and central electricity Authority (CEA). **[6]**

Q2) a) Calculate net present value for following investment with discounting factor of 12 %.

Capital cost Rs. 500000/- .The cash flows generated over six years are Rs. 80000, Rs.110000, Rs. 140000, Rs. 75000; Rs.100000 and Rs. 75000. **[6]**

OR

b) Explain Rate of Return and Revenue cap regulation. **[6]**

Q3) Solve any one: **[6]**

a) Explain phases of tariff determination in regulatory process.

b) Discuss indetail ISO models.

c) What are different adjustments in tariff by which tariff will reduce. Also mention provisions of penalties in tariff .

P.T.O.

Q4) a) Explain Forward and Future markets. **[8]**

b) What is market power? What is the effect of market power on market settlement? How to exercize market power. **[8]**

OR

Q5) a) What is spot market and spot pricing? Explain effect of various forces acting on spot pricing. **[8]**

b) Local marginal price and zonal price are they same? Explain effect of these prices on market settlement. **[8]**

Q6) a) Explain various methods used for transmission pricing. **[8]**

b) What are different ancilliary services? How these are acquired? **[8]**

OR

Q7) a) What is congestion in power network? Why congestion management is required? With suitable examples explain management tools to avoid congestion. **[8]**

b) What are transmission rights? Can these be exercized for congestion management? Also explain in brief arbitrage in electricity commodity. **[8]**

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Total No. of Questions : 7]

SEAT No. :

P4596

[Total No. of Pages : 2

[4860] - 1120

M.E. (Electrical) (Power Systems)

POWER SYSTEM MODELING

(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Solve total four questions. Answer any Two from Q1, Q2 and Q3. Answer 1 question from Q4 or Q5 and Q6 or Q7 each.***

2) ***Assume suitable data if necessary.***

3) ***Write down all the assumptions made.***

Q1) A synchronous machine is having one damper winding on *d* - axis and one damper winding on *q* - axis. Derive the steady state voltage equations in *dq0* frame of reference for this machine when the machine is connected to external network. State the machine model and assumptions involve in it. **[9]**

Q2) Develop the mathematical model of 'T' circuit medium transmission line. Also state the effect of assumptions made for 'T' circuit model on the receiving end voltage and current. **[9]**

Q3) Develop a mathematical model of phase shifting transformer. **[9]**

Q4) Write down a working of d.c. exciter excitation control scheme of alternator. Also state and explain modifications needed in developing dc exciter with pilot exciter scheme. Draw appropriate diagrams wherever require. **[16]**

OR

P.T.O.

Q5) Discuss the types of voltage regulator in brief. Explain working of electro mechanical type of voltage regulator. Draw suitable block diagram. **[16]**

Q6) What is the significance of load modeling in power system? Write down in details the various types of static load modeling represented in power system. Discuss about the assumptions and approximations involved in it. **[16]**

OR

Q7) What is the use of Park's transformation in power system modeling? State Clarke's transformation and Kron's transformation and write about their applicability. Also write down the relationship of these transformations with Park's transformation. **[16]**

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Total No. of Questions : 8]

SEAT No. :

P4597

[Total No. of Pages : 2

[4860] - 1222

M.E. Electrical (Power Systems)

POWER SYSTEM DYNAMICS

(2013 Pattern)

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

Instructions to the candidates:

1) ***Solve total five questions. Answer any Two from Q1, Q2 and Q3. Answer 1 question from Q4 or Q5, and Q6 or Q7 each. Q8 is compulsory.***
2) ***Assume suitable data if necessary.***
3) ***Write down all the assumptions made.***

Q1) Derive the stator voltage expressions for the small signal analysis of single machine model with field circuit only. Write down assumptions involve in it. **[9]**

Q2) Derive stator and rotor equation of synchronous generator represented by model 1.1. Write down assumptions involve in it. **[9]**

Q3) Explain the equal area criterion method for the numerical solution of the Swing equation for the study of transient stability. State clearly the assumptions made. **[9]**

Q4) Derive an expression for power flow for a system consists of 'm' machines. **[10]**

OR

Q5) 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. **[10]**

P.T.O.

Q6) Explain the terms voltage instability and voltage collapse. Discuss the factors affecting it. **[10]**

OR

Q7) Explain with the help of generator, infinite bus and load bus the concept of voltage and angle instability. Draw separate system diagram and waveform to explain each. **[10]**

Q8) a) Two finite machines are connected through 'T' circuit transmission line. Assuming mechanical input constant, calculate the equivalent machine angle and inertia constant if $H_1 < H_2$. Also state the mode in which system will operate. **[6]**

b) Assume hypothetical case of islanding and discuss the implications of inadvertent islanding. **[6]**

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Total No. of Questions : 7]

SEAT No. :

P4289

[Total No. of Pages : 2

[4860]-1230

M.E. (Electrical) (Power Systems)

POWER SYSTEM PLANNING & RELIABILITY

(2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Solve total four questions. Solve any two from Q.1,Q.2 and Q.3. Solve Q.4 or Q.5.Solve Q.6 or Q7.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

Q1) Define load forecasting. Explain in detail weather sensitive and reactive load forecasting methods. **[9]**

Q2) Explain in detail Poisson distribution and Weibull distribution. **[9]**

Q3) Explain in detail integrated resource planning. **[9]**

Q4) a) What are the objectives of transmission planning? **[6]**

b) Explain concept of transmission reliability and data required for composite system reliability evaluation. **[10]**

OR

Q5) a) What are the objectives of network reconfiguration? **[6]**

b) Explain procedure and steps for transmission system planning. **[10]**

P.T.O.

Q6) a) Explain additional interruption indices in distribution system reliability evaluation. **[6]**

b) Explain the effects of lateral distribution and disconnect in distribution system. **[10]**

OR

Q7) a) Explain basic reliability evaluation techniques for parallel network. **[6]**

b) Explain the effects of protection failure and transferring loads in distribution system. **[10]**

Total No. of Questions : 5]

P4290

SEAT No. :

[Total No. of Pages : 2

[4860]-1231

M.E. (Electrical) (Power System)

HVDC AND FLEXIBLE AC TRANSMISSION

(2013 Credit Pattern) (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) Draw the block diagram of UPFC & explain the function of each block.

b) What controls are employed in HVDC system ? Explain.

c) Explain the operation of STATCOM with control scheme.

d) Compare SVC with STATCOM along with their control characteristics.

e) Explain the working of static synchronous series compensator.

f) What are the different dc link converter topologies explain any one in detail.

Q2) a) Explain different configuration of multi terminal HVDC system. **[8]**

b) Compare HVDC light with HVDC transmission system with advantages & disadvantages. **[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) Explain HVDC protection schemes used against over voltages. **[8]**

b) Explain the principle & operation of VSC (Voltage Source Converter) of HVDC transmission. **[8]**

OR

Q5) a) Write about the different existing HVDC links and proposed links in India. **[8]**

b) Compare conventional HVDC with Voltage Source converter HVDC. **[8]**

Total No. of Questions : 6]

SEAT No. :

P4291

[Total No. of Pages : 2

[4860]-1232

M.E. (Electrical) (Power System)

ADVANCED POWER SYSTEM PROTECTION

(2013 Credit Pattern) (Semester - III)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2 , Q.3 or Q.4 and Q.5 or Q.6.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule. Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain the phenomenon of d.c. offset. How d.c. offset and harmonics are considered in Least Error squared (LES) technique ? **[9]**

b) Draw flow chart and explain numerical overcurrent protection. **[9]**

OR

Q2) a) What are different faults in synchronous generator ? What are the causes of these faults ? Explain earth fault protection of synchronous generator. **[9]**

b) How false tripping of digital relay is prevented in the event of magnetising inrush current phenomenon in a power transformer ? **[9]**

Q3) a) What is meant by Over-reach of distance relay ? How this problem is solved in three - stepped distance protection ? **[10]**

b) Write a note on man - machine interface system. **[6]**

OR

Q4) a) Write a note on integrated operation of national power system. **[8]**

b) Explain various features involved in co-ordination of over current relays. **[8]**

P.T.O.

Q5) a) Explain the importance in conducting short circuit studies. Explain P.C. based integrated software features used in short circuit studies. **[10]**

b) State assumptions made for conducting S.C. studies of a power system. **[6]**

OR

Q6) a) With all necessary equations explain algorithm for short circuit studies. **[10]**

b) With reference to algorithm for short circuit studies ,explain transformation to symmetrical components. **[6]**

Total No. of Questions : 8]

SEAT No. :

P4292

[Total No. of Pages : 2

[4860]-1233

M.E. (Electrical Power Systems)

POWER QUALITY ASSESSMENT AND MITIGATION

(603202) (2013 Credit Pattern)(Semester -III)

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) What are good grounding practices which are beneficial for reducing power quality problems. **[6]**

OR

Q2) What is importance of power quality ? Also state symptoms of poor power quality. **[6]**

Q3) Give major reasons of transient over voltages. What are control methods for transient over voltages. **[6]**

OR

Q4) Explain voltage sag characteristics. Also explain voltage limits for computer equipments given by CBEMA curve. **[6]**

Q5) Explain detrimental impacts of harmonics on monitoring and measuring instruments , power cables, capacitors and communication systems. **[6]**

OR

Q6) Explain harmonics generation from utility equipment such as transformer, generator, power cables, power capacitors, power controllers etc. **[6]**

P.T.O.

Q7) Solve any two:

a) Write in detail about selection of power quality monitors. Also explain about monitoring locations and interval. **[8]**

b) What are different approaches followed in power quality monitoring. **[8]**

c) Explain in detail about monitoring requirements for harmonic monitoring. Also give layout of harmonic/power quality analyses. **[8]**

Q8) Solve any two:

a) Explain in detail power assessment under distorted utility supply condition. **[8]**

b) Explain various power quality indices addressing various power quality attributes. **[8]**

c) What is power quality state estimation? How this will be useful in power quality assessment? **[8]**

d) Discuss and user applications for mitigation of power quality. **[8]**

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Total No. of Questions : 5]

SEAT No. :

P4293

[Total No. of Pages : 2

[4860]-1234

M.E. (Electrical) (Power Electronics & Drives)

MODELING AND ANALYSIS OF ELECTRICAL MACHINES

(2013Credit Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***

2) ***Assume suitable data if necessary.***

Q1) a) Derive the expression for instantaneous speed of dc motor and hence comment on the transient behaviour of motor for various disturbances. **[9]**

b) From the basic two-pole machine theory develop the voltage and torque equations of primitive machine. **[9]**

i) Synchronous machine.

ii) Single phase induction motor.

OR

Q2) a) Using voltage matrix, derive the expression for instantaneous torque of a three-phase induction motor. **[9]**

b) Discuss and derive the transformations for currents between a rotating balanced 3-phase winding and a pseudo-stationary 2-phase (d,q) winding. **[9]**

Q3) a) Write the impendence matrix for a 3-Phase 4-salient pole synchronous machine fitted with amortisseurs. Hence obtain an expression for instantaneous torque. **[8]**

b) The parameters of a 3-phase 50 Hz cylindrical-rotor synchronous machine are : **[8]**

Self-inductance per phase = 102 mH

Armature leakage inductance = 0.23 mH

Calculate the mutual inductance between armature Phases and its Synchronous reactance.

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) Discuss how Park's transformations transform equation in (a,b,c) variables to (d,q,0) variables. **[9]**

Q5) Write the short notes on : (any two) **[2 x 8 = 16]**

a) Linearised model of Synchronous machine.

b) Linearised model of Induction motor.

c) Small displacement stability.

Total No. of Questions : 6]

SEAT No. :

P4598

[Total No. of Pages : 2

[4860] - 1235

M.E. Electrical (Power Electronics & Drives)

ENERGY MANAGEMENT AND POWER QUALITY IN ELECTRICAL DRIVES

(2013 Credit Pattern) (Semester - I)

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) Explain in brief various motor selection considerations. **[9]**

b) Explain in detail different types of power quality disturbances. **[9]**

OR

Q2) a) Discuss various losses in the capacitors and maintenance of capacitors. **[9]**

b) Discuss in detail various sources of harmonics. **[9]**

Q3) a) What are different methods for controlling harmonic distortion? **[8]**

b) Write note on power quality state estimations. **[8]**

OR

Q4) a) Discuss a case study for harmonic filter design. **[8]**

b) What are the various causes of voltage flicker? **[8]**

P.T.O.

Q5) a) Explain objectives and consideration of power quality monitoring. **[8]**

b) List various power quality monitoring instruments and briefly explain their use. **[8]**

OR

Q6) a) Explain the application of intelligent system in power quality monitoring. **[8]**

b) Discuss various power quality monitoring standards. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P4294

[Total No. of Pages : 2

[4860]-1236

M.E. (Electrical) (Power Electronics & Drives)

POWER CONVERTERS

(503303) (Semester - I) (2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of electronic calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the operation of Boost converter with necessary waveforms. **[8]**

b) Explain with necessary diagrams and waveforms the operation of a three phase full converter. **[10]**

OR

Q2) a) Describe the working principle of a single phase CSI when its load is a capacitor. Also show that the frequency of input voltage to CSI is twice the frequency of triggering of thyristors. **[8]**

b) Explain with waveforms six step voltage source inverter (120 deg mode). Derive line- line output voltage equation using Fourier series. **[10]**

Q3) a) Describe ZVS resonant converters with appropriate circuit diagram and waveforms. **[10]**

b) What are the advantages and limitations of ZCS converter? **[6]**

OR

Q4) a) Explain voltage source series resonant inverters. **[10]**

b) What are the advantages and limitations of ZVS converter? **[6]**

P.T.O.

Q5) a) What are the advantages and disadvantages of bidirectional control ? Explain single phase bi directional controller with R load. **[10]**

b) A single phase AC voltage regulator feeds an RL load having an impedance angle of 60º . For the conduction angle of 140º, determine the firing angle and load voltage as a ratio of the supply voltage. **[6]**

OR

Q6) a) What is cycloconverter. Explain the operation of three phase cycloconverter with necessary diagram and waveforms. **[10]**

b) What are the advantages and disadvantages of cycloconverters? **[6]**

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Total No. of Questions : 5]

SEAT No. :

P4295

[Total No. of Pages : 2

[4860]-1238

M.E. (Electrical) (Power Electronics & Drives)

AC AND DC DRIVES

(2013 Credit Pattern)(Semester -II)

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

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4.***
2) ***Q5 is compulsory.***

Q1) a) Explain speed control of DC separately excited dc motor fed by a semi converter. Discuss: **[10]**

i) The output waveforms and its effect on torque.

ii) Two quadrant operation of the drive.

iii) Equations for converter output.

iv) Overall performance of the drive and applications.

b) Discuss two quadrant operation of dc chopper fed separately excited dc motor. Write all the expressions to justify the operation of the drive. **[8]**

OR

Q2) a) With necessary sketches, discuss VSI fed 3- phase induction motor. Discuss on harmonics and their effect on motor performance. **[8]**

b) Explain what is principle of field oriented control in induction motor. Compare DC motor control analogy with vector controlled induction motor. **[10]**

Q3) a) Explain the construction, types and applications of stepper motor. **[6]**

b) On switched reluctance motor, explain the following aspects. **[10]**

i) Construction.

ii) Principle of torque generation and speed reversal.

iii) Inductance profile of Stator phase winding.

OR

P.T.O.

Q4) a) What is the basic constructional difference between brushed and brushless dc motor. Explain how the unidirectional torque is generated in brushless dc motor. **[8]**

b) Discuss the modes of operation and speed control of switched reluctance drive. State the advantages of switched reluctance motor drive over other ac motor drives. **[8]**

Q5) a) Write the dynamic model of dc separately excited motor and derive the transfer function for armature controlled separately excited dc motor. **[6]**

b) From the modeling equations of dc motor, draw the closed loop control system with reference input is armature voltage and speed is the controlled output. Explain closed loop control. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P4296

[Total No. of Pages : 2

[4860]-1239

M.E. (Electrical) (Power Electronics and Drives)

DESIGN OF POWER ELECTRONIC SYSTEMS

(2013 Credit 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 mathematical model of MOSFET. **[9]**

OR

Q2) Derive the mathematical modeling of single phase inverter using circuit averaging method. **[9]**

Q3) a) Design a heat sink for a dc-dc Boost system. **[6]**

b) For the Buck converter, find the peak device current, the peak dissipation and the case to ambientthermal resistance. Use maximum junction temperature of 150ºC and the ambient temperature to be at 40ºC and the case temperature should not exceed 60ºC. Duty ratio is 40%. The thermal impedance at 400mS is Z= 0.4ºC/W. **[3]**

OR

Q4) An inductor is to be designed to meet the following specifications. L=4 millihenries; Irms = 2A sinewave; f = 200 kHz; Ts = 90ºC and Ta = 30ºC. The inductor is to be fabricated on a double-E core made from 3F3 ferrite. The windings are be made with foil conductors which have kcu = 0.6. A core size of a = 2 cm is chosen for the design.

a) Determine the conductor cross-sectional area, Acu, and number of turns N. Ignore eddy currents and the proximity effect.

b) Specify the length of the airgaps in the core. Assume four distributed airgaps. **[9]**

P.T.O.

Q5) Explain the zero voltage switching technique in a Buck converter with necessary diagrams and waveforms. **[16]**

OR

Q6) Design a 48V, 10A power supply from a 12V dc source. Allow an input voltage drooping of 10% in long time. The output voltage ripple should be less than 1% of the dc output voltage magnitude. The switching frequency is required to be 200 kHz. Limit the maximum load current to be 15A. **[16]**

Q7) a) Explain how device is turn on. Explain any two methods or turning on SCR. **[7]**

b) For step down converter circuit, the dc input voltage V_d = 500V, the load current I_O = 500A, and the switching frequency is 1kHz. The free wheeling diode has a reverse recovery time t_{rr} =10μs. The GTO has a current fall time t_{fl}=1μs, a maximum applied voltage rate dv/dt =50 V/μs, and a maximum controllable anode current I_{AM} = 1000A.

i) Find the appropriate values for resistance R_s and capacitance C_s for the turn - off snubber circuit.

ii) Estimate the power dissipated in the snubber resistance. **[9]**

OR

Q8) a) Why isolation is required. What are different isolation circuits. Explain any one isolation circuit in detail required for power device. **[8]**

b) Explain turn off snubber in detail. **[8]**

Total No. of Questions : 4]

SEAT No. :

P4297

[Total No. of Pages : 2

[4860]-1240

M.E. (Electrical) (Power Electronics and Drives)

ADVANCED CONTROL SYSTEMS

(2013 Credit 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) ***Figurs to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of electronic calculator is allowed.***

Q1) a) With a diagram explain state observer. **[4]**

b) Consider a plant described by **[5]**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

and has a performance index

$$J = \int_0^\infty (x^T Q x + u^T R u) dt \quad \text{where } Q = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \text{and } R = [1]$$

Determine the optimal feedback gain matrix k.

Q2) a) Write a short note on robust control. **[4]**

b) Define equilibrium point. Also find all equilibrium points of the following system. **[5]**

$$\dot{x}_1 = -x_1 + x_2(1 + x_1)$$
$$\dot{x}_2 = -x_1 + x_1^2$$

OR

c) Explain any one method of linearization in detail. **[5]**

P.T.O.

Q3) a) Explain the technique of sliding mode control. Why chattering is observed in SMC? Illustrate how it can be mitigated? **[6]**

b) For the third order system given below, design the sliding mode controller that will yield damping of 0.8 and setting time of 1 sec. Consider matched disturbance of 2sint. **[10]**

$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

Q4) a) Find the transfer function of buck converter. **[5]**

b) Explain any three power quality devices in detail. **[6]**

c) With diagram explain distribution generation in detail. **[5]**

Total No. of Questions : 6]

SEAT No. :

P4298

[Total No. of Pages : 2

[4860]-1241

M.E.Electrical (Power Electronics and Drives)

POWER ELECTRONICS APPLICATIONS

(2013 Credit Pettern) (Semester-III)

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

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4,Q5 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) What is the role of power electronics in power system in today's' context. Expalin any one application of power electronics in power system. **[4]**

b) Draw the block diagram and explain in brief the operation of wind energy system. **[4]**

c) What is importance of harmonics in HVDC operation? How is characteristics harmonic different from non characteristics harmonic discuss. **[4]**

d) Explain with a neat sketch and waveforms the TCSC type of series controller. **[6]**

OR

Q2) a) What are the different parameters to control power flow in ac systems given their relative importance? **[4]**

b) Draw the block diagram of the solar PV system and explain the operation in detail. **[4]**

c) Discuss criteria of design of ac filters. Also mention various types of ac filters and also show their circuit configurations. **[4]**

d) Explain TSC, TSR &TCR by covering the following points. **[6]**

i) Diagram.

ii) Operation.

iii) V-I char.

iv) Loss char

P.T.O.

Q3) a) Draw the equivalent circuit of single phase static synchronous compensator. Explain its working and state the advantages over synchronous condenser. **[10]**

b) Develop and describe the connection diagram for twelve pulse STATCOM for three phase system. **[6]**

OR

Q4) a) Draw the equivalent circuit of UPFC connected at midpoint of system. Comment on control of shunt and series converter. **[10]**

b) Describe the application of UPFC for voltage and power flow problems. **[6]**

Q5) a) Explain the working of switched mode power supply and describe different topologies in SMPS. **[10]**

b) Draw the bolck diagram of energy storage system for vehicle and describe in detail. **[6]**

OR

Q6) Explain the applications of power electronics for design and development of

a) Electronic Ballast **[8]**

b) AC-DC electric locomotive systems. **[8]**

Total No. of Questions : 7]

SEAT No. :

P4299

[Total No. of Pages : 2

[4860]-1242

M.E. (Power Electronics and Drives)

POWER ELECTRONICS IN SMART GRID

(2013 Credit Pettern) (Semester -III) (603302)

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

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***

Q1) a) Explain the applications of energy storage considering its primary function as to deliver short term power. **[4]**

b) Explain the causes of EMC cases in distributed power system and related phenomena in smart system. **[5]**

OR

Q2) a) Discuss issues, monitoring and mitigation methods of power quality. **[5]**

b) Explain the CDM (Clean Development Mechanism) in smart grid. **[4]**

Q3) a) Write a short note on Distributed generation past and future. **[4]**

b) Explain Trapezoidal HFAC inverter -front end source with PFC. **[5]**

OR

Q4) a) Explain with the block diagram the advanced propulsion power distribution system for hybrid vehicles. **[5]**

b) Describe issues of Interconnected Grid system. **[4]**

Q5) Describe any 2 from following. **[16]**

a) Comparison between home area network (HAN) and wide area network (WAN)

b) Wi-Fi based communication

c) Basics of CLOUD computing

d) Cyber security for smart grid

P.T.O.

Q6) a) Explain voltage control scheme used with D-STATCOM. **[8]**

b) Explain DVR and control strategies of DVR arrangements. **[8]**

OR

Q7) a) Explain AC/AC electromechanical voltage regulator. **[8]**

b) Explain operation of D-STATCOM along with decoupled current control method. **[8]**

Total No. of Questions : 8]

SEAT No. :

P4599

[Total No. of Pages : 2

[4860] - 1243

M.E. (E & TC) (Microwave)

ELECTROMAGNETICS AND ANTENNA THEORY

(2013 Credit Pattern) (Revised) (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 the expression for current distribution for the half wave dipole; write its far field equation, its power radiated and radiation resistance. **[5]**

b) Write a detailed note on Rhombic antenna with respect to structural details, specifications, radiation pattern, design procedure, advantages, disadvantages and applications. **[5]**

Q2) In a nonmagnetic medium **[10]**

$$\bar{E} = 10\sin(2\pi \times 10^7 t - 0.5x)\hat{a}_z \ \ V/m$$

Find

a) ε_r, η

b) The time – average power carried by the wave

c) The total power crossing 100 cm^2 of plane $2x + y = 5$

Q3) Draw the radiation pattern of 10 element linear antenna array with progressive phase shift 60° and the inter element distance to be half wave length. **[10]**

P.T.O.

Q4) a) Define the following antenna parameters with illustrative diagrams and mathematical expressions. **[5]**

i) Radiation Intensity

ii) Power Density

iii) Antenna efficiency

iv) Directivity

v) Linear, circular polarization

b) The aperture dimensions of a pyramidal horn are 10×4cm. It is operating at a frequency of 8GHz. Find the beam width, power gain and directivity. **[5]**

Q5) a) Define and explain the significance of the Retarded Vector Magnetic Potential and its applications in Antenna Analysis with relevant mathematical support. **[5]**

b) Explain the Uniqueness principle with illustrative diagrams and mathematical expressions. **[5]**

Q6) Write short notes on : **[10]**

a) Circular patch

b) E-plane Horn

c) H-plane Horn

d) Pyramidal Horn

Q7) a) Derive the array factor for a linear array of N elements taking the center element as reference element. Assume the number of elements N to be odd. **[4]**

b) Calculate the array coefficients using Design Dolph-Tschebyscheff's procedure for N = 7 and side lobe level to be below 26dB. **[6]**

Q8) a) Explain the Structural details, dimensions, radiation pattern, specifications, features and applications of Spiral Antenna and explain the design procedure. **[6]**

b) Explain the various analysis techniques for Micro Strip Antenna with illustrative diagrams. **[4]**

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Total No. of Questions : 8]

SEAT No. :

P4600

[Total No. of Pages : 2

[4860] - 1244

M.E. (E & TC) (Microwave)

RF AND MICROWAVE CIRCUITS

(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Solve any five questions.***
2) ***Figures to the right indicates full marks.***
3) ***Assume suitable data, wherever necessary.***

Q1) a) Derive the expression for propagation constant, Impedance and Power flow for the Lossless Coaxial line. **[5]**

b) Explain the concept of Intersymbol interference. How ISI affects the wireless communication. **[5]**

Q2) a) Derive the expression for lumped element circuit model for transmission line. **[5]**

b) Four different load impedances : **[5]**

i) $Z_L = 50\ \Omega$ ii) $Z_L = 48.5\ \Omega$

iii) $Z_L = (75 + j\ 25)\ \Omega$ iv) $Z_L = (10 - j\ 5)\ \Omega$

are sequentially connected to a 50 Ω transmission line. Find the reflection coefficients and the SWR circles. Also determine return loss in dB.

Q3) a) Explain with equivalent circuit diagram working of. **[5]**

i) Wilkinson Power divider ii) Lange Coupler

b) Write a note on dynamic range and Sources of noise in microwave circuits. **[5]**

P.T.O.

Q4) a) Design a single section quarter wave matching transformer to match a 10 Ω load to a 50 Ω transmission line at f_0 = 3GHz. Determine the percent bandwidth for which the SWR ≤ 1.5. **[5]**

b) A 2W Power Source is connected to the input of a directional coupler with C = 20dB, D = 35dB and insertion loss of 0.7dB. Find the output powers in (dBm) at the through, coupled and output ports. Assume all ports are to be matched. **[5]**

Q5) Explain the working principle of **[10]**

a) Tunnel diode b) PIN diode

Q6) a) Design a BJT colpitts Oscillator for 200 MHz in common emitter configuration having bias point of V_{ce} = 3 volt, I_c = 3 mA. Following circuit parameters are given at room temperature of 25ºC. C_{BC} = 0.1 PF, r_B = 2 kΩ, r_{CE} = 10 kΩ, C_{BE} = 10PF. If the inductance should not exceed $L_3 = L$ = 5nH, find the values for capacitances in feedback loop. **[7]**

b) Explain the concept of Unilateral design. **[3]**

Q7) a) With the help of equivalent circuit diagram explain the working of Crystal Oscillator. **[5]**

b) Explain in detail the concept of stability circle for stability consideration related to amplifier design. **[5]**

Q8) An RF amplifier has following S-parameters : **[10]**

$S_{11} = 0.3 < -70º$, $S_{12} = 0.2 < -10º$, $S_{21} = 3.5 < 85º$, $S_{22} = 0.4 < -45º$.

Furthermore, the input side of the amplifier is connected to voltage source with V_S = 5V and Source impedance Z_S = 40 Ω. The output is utilized to drive an antenna which has an impedance of Z_L = 73 Ω. Assuming that S - parameters of the amplifier are measured with reference to a Z_0 = 50 Ω characteristic impedance, Find the following quantities :

a) Transducer gain G_T, Unilateral transducer gain G_{TU}, available gain G_A, Operating Power gain G and.

b) Power delivered to the load P_L, available power P_A, and incident power the amplifier P_{inc}.

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Total No. of Questions : 8]

SEAT No. :

P4300

[Total No. of Pages : 2

[4860]-1245

M.E. (E & TC) (Microwave)

MICROWAVE MEASUREMENTS

(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Attempt any one question from Q.1 and Q.2.***
2) ***Attempt any two questions from Q.3,Q.4 & Q.5.***
3) ***Attempt any two questions from Q.6,Q.7 & Q.8.***

Q1) a) Explain the concept of uncertainty and confidence in measurement. **[5]**

b) Show that reflection coefficient for transmission line is $\Gamma = z_1 - z_0 \,/\, z_1 + z_0$. **[5]**

Q2) a) Find 's' parameters for microwave T junction (E or H plane tee) **[5]**

b) Explain concept of uncertainty related to RF match. **[5]**

Q3) What is attenuation? Explain the mismatch error with necessary diagram. **[10]**

Q4) Discuss power measurement technique for RF power. **[10]**

Q5) Describe the following with necessary diagram. **[10]**

a) Inductive voltage divider

b) Dual channel voltage ration system for attenuation measurement.

P.T.O.

Q6) Explain the basic working principle of spectrum analyzer with its applications. **[10]**

Q7) What is noise? Explain the different types of noise and sources with significance of noise measurement. **[10]**

Q8) State the different types of power sensors and explain any two in detail. **[10]**

Total No. of Questions : 8]

SEAT No. :

P4301

[Total No. of Pages : 2

[4860]-1246

M.E. (Electronics) (Digital System)

RESEARCH METHODOLOGY

(2013 Credit Pattern) (Semester-I) (504104)

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) a) Distinguish between Research methods and Research methodology. **[5]**

b) What is research problem? Define the main issues which should receive the attention of the researcher in formulating the research problem. Explain with suitable example. **[5]**

Q2) a) Explain with an example the role of DSP if collected data contains noise. **[3]**

b) How will you differentiate between descriptive statistics and inferential statistics? **[3]**

c) Discuss the issues and trends of Research in the Industrial Context. **[4]**

Q3) a) Explain the significance of following parameters in research with suitable examples. **[6]**

i) Mean.

ii) Median.

iii) Mode.

b) Write a note on Research and scientific method. **[4]**

Q4) a) What is regression analysis? Explain it with a suitable example. **[5]**

b) What is principal component analysis? Where it is used? **[5]**

P.T.O.

Q5) a) What are the methods to verify the performance of process system? **[5]**

b) Explain the technique and importance of oral presentation of research findings. Is only oral presentation sufficient? If not, why? **[5]**

Q6) a) What do you mean by Sensitivity theory. Give its applications. **[4]**

b) Discuss the factors for motivation of Research. **[3]**

c) What is state vector machine? How it is related with Research design? **[3]**

Q7) a) Write a brief note on the "task of interpretation" in the context of research methodology. **[3]**

b) Explain the characteristics of a good research report. **[3]**

c) What is Primary Data? Explain any one method of collecting primary data using modern tools. **[4]**

Q8) Write short note on the following:

a) Characteristics of a good research problem. **[4]**

b) Multiscale modeling and its significance. **[3]**

c) Parameter estimation. **[3]**

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Total No. of Questions : 8]

P4635

SEAT No. :

[Total No. of Pages : 2

[4860] - 1247

M.E. (E & TC) (Microwave)

COMPUTATIONAL ELECTROMAGNETICS

(2013 Pattern) (Semester - II)

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) State different errors in numerical solution & explain how they affect the accuracy & Stability of FD Function. **[5]**

b) Explain Electromagnetic problem in detail. Also explain the most common steps to solve them. **[5]**

Q2) a) What are band matrix methods & iteration methods. **[5]**

b) Derive Green's function (G) corresponding to PDE for free space. **[5]**

Q3) a) Explain FDTD analysis in two dimensions & three dimensions in detail. **[6]**

b) Explain strength & weaknesses of FDM modeling. **[4]**

Q4) a) Compare FDM and FDTD. **[5]**

b) Explain Galerkin's Method. **[5]**

Q5) a) Explain the method of weighted residuals. **[4]**

b) Explain the Ritz variational Method.Also explain applications of Ritz approach. **[6]**

Q6) a) Explain strength & weaknesses of MoM. Also explain its applications in short. **[6]**

b) Explain Helmholt'z wave equation. **[4]**

P.T.O.

Q7) a) Short note on various commercial computational Electromagnetics software. **[5]**

b) Using MoM derive expression for field distribution using integral form of potential equation. **[5]**

Q8) a) State various computational methods. Explain any one in detail. **[7]**

b) Explain the lattice truncation condition. **[3]**

Total No. of Questions : 7]

SEAT No. :

P4655

[Total No. of Page :1

[4860]-1248

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

RF AND MMIC TECHNOLOGY

Time : 3 Hours] *[Maximum Marks : 50*

Instructions to the candidates:

1) ***Solve any five questions.***
2) ***Draw diagram wherever necessary.***
3) ***Assume suitable data if necessary.***

Q1) a) Explain advantages, disadvantages, cost, performance, size, cost, reliability & applications of HMIC, MMIC. **[5]**

b) Explain micro strip Couplers & Power Splitters in detail. **[5]**

Q2) a) Enlist the Multichip module Technology & explain in detail. **[5]**

b) Explain Via holes & grounding methods. **[5]**

Q3) a) Enlist the methods for synthesis on non-linear MICs. Explain any one in detail. **[5]**

b) What is synthesis of MIC. Explain any one method in detail. **[5]**

Q4) a) Explain different types of MMIC Switches. **[5]**

b) Write short note on application of MMICs to **[5]**

i) Radio system

ii) Satellite Communication.

Q5) a) Enlist & explain the various applications of MMICs. **[4]**

b) Explain MMIC design cycle. **[6]**

Q6) a) Explain in brief Digital modulators & Multipliers. **[5]**

b) Explain Phase shifters & Up converters. **[5]**

Q7) a) Explain CAD Package features & List the circuit Simulation engines. **[6]**

b) Write a short note on integrated CAD Design environment. **[4]**

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Total No. of Questions : 6]

SEAT No. :

P4302

[Total No. of Pages : 2

[4860]-1249

M.E. (E & TC) (Microwave)

WIRELESS COMMUNICATION SYSTEM

(2013 Credit Pattern) (Semester-II) (Revised) (504309)

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.***
5) ***Answer any five questions.***

Q1) a) Write a short note on tele-traffic engineering. **[3]**

b) Explain the handoff mechanisms for cellular communications. **[3]**

c) Derive the reuse ratio 9 factor, beginning from hexagonal cell geometry. **[4]**

Q2) a) Explain attenuation of wave over a reflecting surface. **[3]**

b) Write a short note on Radio wave propagation. **[3]**

c) Explain propagation path-loss models. **[4]**

Q3) a) Explain GSM frame and slot structures. **[4]**

b) Write a short note on CDMA 2008 traffic types. **[3]**

c) Write a short note on logical channels of GSM. **[3]**

Q4) a) Draw the diagram of a scrambler with a 5 stage shift register used in UMTS and explain its function with the example. **[4]**

b) Explain MAC layer protocol in UMTS. **[3]**

c) Explain UMTS system features. **[3]**

P.T.O.

Q5) a) Write a detailed note on standardization activities for cellular systems. **[5]**

b) Explain wireless network architecture in UMTS. **[5]**

Q6) a) Draw the propagation model for line of sight propagation, derive the power received under this case, and explain the each term. **[5]**

b) A hexagonal cell within a four-cell system has a radius of 1.387 km. A total of 60 channels are used within the entire system. If the load per user is 0.029 Erlangs, and $\lambda = 1$ call/hour, compute the following for an Erlang C system that has a 5% probability of a delayed call: **[5]**

i) How many users per square kilometer will this system support?

ii) What is the probability that a delayed call have to wait for more than 10 s?

iii) What is the probability that a call will be delayed for more than 10 seconds?

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Total No. of Questions : 6]

SEAT No. :

P4601

[Total No. of Pages : 2

[4860] - 1250

M.E. (E & TC) (Microwave) (II Year)

EMI AND EMC TECHNIQUES

(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) With practical examples distinguish conducted, radiated and transient EMI. **[2]**

b) State types of EMI suppression technique. Explain grounding technique in detail. **[4]**

c) Give details about EMI specifications and limits with respect to civilian and military standards. **[4]**

Q2) a) What are the parameters influencing EMI in transmitter and receiver? **[2]**

b) State the multi – level prediction process in detail. **[4]**

c) What is amplitude culling and frequency culling with respect to transmitter and receiver? **[4]**

P.T.O.

Q3) a) Draw general flow diagram used for prediction and for solving EMI problems. **[2]**

b) State classification of interferences on the basis of receiver and interference bandwidths. Explain class A interference. **[4]**

c) What are the different types of filters used in EMI for insertion loss? Describe how best the filtering technique will help you to reduce the EMI. **[4]**

Q4) a) Explain with neat diagram measurement of radiation emission and radiation susceptibility. **[5]**

b) What is microwave anechoic chamber? Explain. **[5]**

Q5) a) What are the precautions in earthing? **[5]**

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

Q6) a) Write short note on Lumped element low pass filter. **[5]**

b) What is pigtail effect with respect to EMC connector? **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4303

[Total No. of Pages : 2

[4860]-1251

M.E. (E & TC) (Microwave)

RADAR & SATELLITE COMMUNICATION

(2013 Credit Pattern) (Semester-III) (Elective-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) Explain the basic principles of a radar system with neat block diagram. Give the limitations and applications of radars. **[6]**

b) Derive the radar range equation. Explain the factors that affect the maximum range of radar. **[4]**

Q2) a) Explain with neat block diagram the working principle of continuous wave radar. **[5]**

b) Explain basic principle of Pulsed radar system. **[5]**

Q3) a) Write short notes on: **[4]**

i) Radar Beacons.

ii) MTI Radar.

b) Discuss the ambiguity in radar range equation. **[3]**

c) Explain how the radar is used in remote sensing. **[3]**

Q4) a) Explain the concept of Correlation with respect to radars. **[6]**

b) Explain the Doppler effect in Radar system. **[4]**

P.T.O.

Q5) a) With respect to satellite communication explain the following multiple access techniques: **[4]**

i) CDMA.

ii) ALOHA.

b) Explain with neat block diagram concept of TTC & M in satellite communication. **[6]**

Q6) a) Comment on various interferences and noise sources in satellite communication system. **[4]**

b) Explain in brief the concept of link design for Geostationary satellites. **[6]**

Q7) a) Which conditions should be fulfilled to attain a geostationary orbit? **[2]**

b) Explain various advantages & limitations of satellite communication. **[4]**

c) Define elevation & inclination angles along with their significance. **[4]**

Q8) a) What are the primary factors needed for defining an orbit of a satellite? **[4]**

b) What is antenna misalignment loss? Propose a solution to overcome these losses. **[3]**

c) Discuss the design considerations of a communication satellite. **[3]**

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Total No. of Questions : 8]

SEAT No. :

P4602

[Total No. of Pages : 2

[4860]-1252

M.E. (E&T/C) (VLSI & Embedded Systems)

DIGITAL CMOS DESIGN

(2013 Credit 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) With the help of structure of MOSFET, explain the sources of parasitic capacitances. Explain capacitances involved in various operating regions of MOSFET. With the help of model, comment on the dominant capacitance. How to minimize it? **[5]**

b) Explore wiring paracitics in detail. What is sheet resistance? What is its significance? How does it play a role during on-chip wiring? **[5]**

Q2) a) What is SPICE? List 5 parameters of MOSFET SPICE model & explain how these parameters are useful in chip design, What are SPICE levels? **[5]**

b) What are different fabrication techniques? With the help of suitable digrams explain any one of them in detail. What are the limitations occur due to technology scaling? **[5]**

Q3) a) Certain logic operates at supply of 1 Volt at load of 1 pF. To what maximum frequency will it operate if permissible power dissipation is 1 mW? Compute Power Delay Product. **[4]**

b) What is cross talk? List sources & mitigation techniques. **[4]**

c) Explain static & short circuit dissipations. **[2]**

Q4) a) What are delay estimation & analysis techniques? Comment on their accuracies. Explore any one of them in detail. **[4]**

b) What is need of transistor sizing & symmetry in logic design? How does mobility (μ) play the role? Explain with an example. **[4]**

c) Write about design margin in brief. **[2]**

P.T.O.

Q5) a) With the help of schematic, explore the operating regions & detail analysis of CMOS inverter. Give the expressions for V_{OUT} for each region. Comment on the region where both the MOSFETs are in saturation. **[4]**

b) Design one bit latch using Transmission Gates. Compare with conventional method. **[4]**

c) What is dynamic hazard? With the help of schematic-waveforms, explain sources & solutions to it. **[2]**

Q6) a) Draw FSM diagram & wirte HDL code for N bit resetable counter. **[4]**

b) Explain flip-flip timings & their significance in metastability. **[4]**

c) Draw different techniques to built tri-state logic. **[2]**

Q7) a) Explain cascode voltage switch logic in detail. What are merits & demerits? **[4]**

b) What is need of BiCMOS? Explain with example. **[4]**

c) Write note on sense amplifier circuit. **[2]**

Q8) a) What are different techniques for low power logic design? Explore any one in detail. **[4]**

b) Explain domino logic with waveforms. **[4]**

c) Explain in brief about materials used for performance improvement. Comment on respective improvement. **[2]**

Total No. of Questions : 8]

SEAT No. :

P4304

[Total No. of Pages : 2

[4860]-1253

M.E. (E & TC) (VLSI & Embedded Systems)

EMBEDDED SYSTEM DESIGN

(2013 Credit 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 hand side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) What is a design Metric? Discuss various metrics considered in Embedded System Design. **[5]**

b) Identify and briefly discuss the steps that comprise the waterfall life cycle model. **[5]**

Q2) a) Discuss System requirements versus system specifications. **[5]**

b) What is the major reason for partitioning a system? During which stage of design system partition occurs? **[5]**

Q3) a) Explain in brief, ARM9TDMI5 stage pipeline organization. **[5]**

b) Explain in brief ARM architectural support for an operating system. **[5]**

Q4) a) Define the term context switching with reference to **[4]**

i) When to switch.

ii) Register state.

b) Write short note on, “Development tools for embedded systems”. **[3]**

c) Explain the memory interface with ARM by using suitable diagram. **[3]**

P.T.O.

Q5) a) What are the storage considerations in an embedded Linux. **[3]**

b) Differentiate between BIOS and Boot Loader. **[3]**

c) Explain in brief the kernel configuration (Kconfig) in Linux. **[4]**

Q6) a) Write short note on Linux Kernel initialization. **[5]**

b) What are the device drivers? Why device drivers are essential? **[5]**

Q7) a) Explain in detail Android manifest file and its structure. **[4]**

b) What is use of Intents in android operating system. **[3]**

c) What are the main features of an android operating system? **[3]**

Q8) a) Explain in brief the architecture of android operating system. **[5]**

b) Write the short note on: **[5]**

i) Telephony and SMS in an android operating system.

ii) Contents Providers and Services.

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Total No. of Questions : 8]

SEAT No. :

P4305

[Total No. of Pages : 2

[4860]-1254

M.E. (E & TC) (VLSI & Embedded Systems)

RECONFIGURABLE COMPUTING

(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 side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Give the key differences between reconfigurable machines and conventional processors. **[4]**

b) Explain the distinguishing features of Configurable, Programmable, and fixed-Function devices. **[4]**

c) Draw 2 context 4-LUT and explain its working for combinational and sequential configuration. **[2]**

Q2) a) Explain with suitable the metrics Functional Capacity, Data Density and Functional Diversity. **[5]**

b) Compare ASIC, GPP, FPGA, Memory, RALU, PDSP, CPLD and RD with respect to power consumption, design efforts, throughput and NRE, speed and time to market. **[5]**

Q3) a) Explain in detail the issues in Reconfigurable network design. **[4]**

b) State Rent rule and explain Rent rule based hierarchical interconnect model. **[4]**

c) State the effects of interconnect granularity. **[2]**

P.T.O.

Q4) a) Find the number of bits required to specify each LUT's interconnect for a 1000 4-LUT device with 200 inputs compare it with bits required by 9000 4-LUT device with 600 inputs and comment on it. **[4]**

b) Elaborate the term "Multi Context Device", with proper diagram. **[4]**

c) Define the term instruction distribution bandwidth. **[2]**

Q5) a) State and explain various methods for instruction stream compression. **[4]**

b) Explain the RP space area model. **[4]**

c) Elaborate the term "coarse grain" and "fine grain". **[2]**

Q6) a) Give the basic architecture of DPGA and explain multicontext 4-LUT from it. **[5]**

b) Explain with suitable diagram the Array element of DPGA. **[5]**

Q7) a) Draw and explain in brief the architecture of Matrix. **[4]**

b) What are the advantages of MATRIX architecture over general purpose architecture. **[4]**

c) Explain the term partial reconfigurability. **[2]**

Q8) a) Explain the application Rapid prototyping using reconfigurable platform. **[4]**

b) What are Promises of RC to DSP. **[4]**

c) Explain the relation between Design W and Architecture W. **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4306

[Total No. of Pages : 2

[4860]-1256

M.E. (E & TC) (VLSI & Embedded Systems)

ANALOG CMOS DESIGN

(2013 Credit 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) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain the effect of channel length modulation and body effect on MOSFET & show how these are accounted in basic small signal model. **[5]**

b) With the help of suitable schematic and necessary expressions, explain MOSFET as switch, diode and active resistor. **[5]**

Q2) a) For subthreshold MOS model, explain weak inversion using its transconductance characteristics and equations involved. Also explain significance of weak inversion. **[5]**

b) Explain in detail, short channel effects: threshold voltage variation, velocity saturation and output impedance on overdrive voltage. **[5]**

Q3) a) Explain the performance parameters of CMOS operational amplifier. **[5]**

b) Design cascode current mirror for i_{OUT} 100 μA. Assume suitable data. **[5]**

Q4) a) Explain significance of micropower Op amp with examples of two stage miller Op and push-pull output Op amp. **[5]**

b) Design CS-CG cascode amplifier for A_V = 60 dB and bandwidth 10 MHz. **[5]**

P.T.O.

Q5) a) Explain static characteristics of Digital-to-Analog converter used for signal processing applications. Also explain offset error and gain error with respect to static characteristics. **[5]**

b) Draw circuit diagram of switched capacitor inverting amplifier and derive expression for its transfer function. **[5]**

Q6) a) Write short notes on: **[6]**

i) Switched capacitor.

ii) Bandwidth estimation.

iii) Zeros as bandwidth enhancer.

b) If the sampled analog input applied to an 8-bit SAR converter is 0.7 V_{ref}. Find output digital word. **[4]**

Q7) a) Explain design considerations for RF chip design. **[4]**

b) Draw schematic of any one type of CMOS mixer and explain its design with analysis. **[6]**

Q8) a) Draw differential LNA, and explain how it overcomes drawbacks of single ended LNA. **[5]**

b) In Low Noise Amplifier (LNA) design, explain how noise and power tradeoff is achieved with respect to different LNA topologies. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4307

[Total No. of Pages : 2

[4860]-1257

M.E. (ETC) (VLSI & Embedded System)

SYSTEM ON CHIP

(2013 Credit Pattern) (Semester-II) (504208)

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

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***All questions carry equal marks.***
4) ***Your are advised to attempt not more than 5 questions.***
5) ***Your answers will be valued as a whole.***
6) ***Assume suitable data, if necessary.***

Q1) a) Explain control flow modeling.

b) Describe software implementation of data flow.

Q2) a) How to determine the H/W implementation of an FSMD?

b) What is One-way and two-way Handshake?

Q3) a) Discuss why it is a bad idea to model datapath expressions as FSM.

b) Explain time multiplexing of two hardware module ports over a single control shell.

Q4) a) What are the limitations of FSM?

b) Write ASIP Design flow and how ASIP design flow show better performance than SOC design based on hardware.

Q5) a) What is motion compensation (MC)?

b) Explain combinational Read-write Race.

P.T.O.

Q6) a) What is Simulation-Synthesis Mismatch?

b) Explain causes of power dissipation.

Q7) a) Which are the Factors Affecting Delay and Slew?

b) What is the need of memory optimization and management in SOC?

Q8) a) Explain any one Real time dynamic voltage scaling scheduling algorithm.

b) Explain Energy Management Techniques for SOC Design.

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Total No. of Questions : 8]

SEAT No. :

P4308

[Total No. of Pages : 2

[4860]-1258

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 5 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***All questions carry equal marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) a) What are the challenges in real time embedded signal processing? **[3]**

b) Explain the structure of 5-point and 10-point running average filter with suitable equations and also explain how increase in sampling frequency affects the output? **[5]**

c) What is the concept of moving window in signal processing. **[2]**

Q2) a) Realize the FIR transfer function $H(z) = 1–3.6z^{-1} + 5.4z^{-2} – 4.32z^{-3} + 1.944z^{-4} – 0.466z^{-5} + 0.0467z^{-6}$ in the following forms: **[6]**

i) Direct form I

ii) Direct form II

iii) Cascade of six first order sections.

b) Explain how median filter reduces the impulse noise. **[4]**

Q3) a) Find out the transfer function and the frequency response of the Hanning filter with coefficients {0.1, 0.2, 0.4, 0.2, 0.1}. Plot the magnitude and phase response. **[5]**

b) Design notch filter with suitable equations and explain how the location of pole affects its behavior. **[5]**

P.T.O.

Q4) a) Draw the signal flow graph of 4 pt DIT-FFT. **[4]**

b) Explain adaptive FIR filter with the least mean square (LMS) algorithm. **[4]**

c) Evaluate the stability of system $H(z) = z/(z - a)$ for different values of coefficient a. **[2]**

Q5) a) Discuss finite wordlength effects. **[4]**

b) What are the important features of TMS320C67XX processor? Draw and explain the block diagram of TMS320C67XX. **[6]**

Q6) a) Explain different addressing modes of TMS320C54XX. **[4]**

b) Compare TMS320C54XX and TMS320C67XX with respect to architecture, MIPS, memories and addressing modes. **[6]**

Q7) a) Explain with an example how FFT algorithm can be implemented in TMS320C67XX. **[4]**

b) Compare and contrast fixed and floating point processors. **[3]**

c) Justify the necessity of MAC and barrel shifter in DSP processor. **[3]**

Q8) a) Explain how performance of DSP processor can be improved with pipelining. **[4]**

b) Explain how Dual Tone Multi Frequency is generated using two IIR filters connected in parallel. How Goertzel filters are used for DTMF detection. **[6]**

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Total No. of Questions : 8]

SEAT No. :

P4603

[Total No. of Pages : 2

[4860]-1259
M.E. (E&TC) VLSI & Embedded System
FAULT TOLERANT SYSTEMS
(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) Construct a binary decision diagram for $f = \bar{a}bc + a\bar{b}c + abc$ considering "a" as root node. **[5]**

b) Compare & contrast parallel, deductive & concurrent simulation techniques. **[5]**

Q2) a) Write a short note on fault sampling. **[5]**

b) Discuss the general aspects of compression techniques. **[5]**

Q3) a) Explain transition - count compression technique in detail. **[5]**

b) Draw & explain state diagram of TAP controller. **[5]**

Q4) a) Describe the various trade-offs which need to be considered for DFT. **[5]**

b) Illustrate in detail flow of event-driven simulation with the help of flowchart. **[5]**

Q5) a) Why simulation is preferred over prototype for verification of new design? **[2]**

b) Determine different levels of modeling. **[3]**

c) Write a short note on self-checking berger code checkers. **[5]**

P.T.O.

Q6) a) What is statistical fault analysis? **[5]**

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

Q7) a) Justify how k/n & Berger codes can be used to detect multiple bit errors. **[5]**

b) Explain in detail with timing diagram different delay models with respect to 2 input AND gate. **[5]**

Q8) a) Briefly explain exhaustive & pseudorandom form of testing. **[5]**

b) Explain following terms: **[5]**

i) Stuck RTL variables

ii) Fault variables

Total No. of Questions : 8]

SEAT No. :

P4309

[Total No. of Pages : 3

[4860]-1260

M.E. (E & TC) (VLSI & Embedded Systems)

ASIC DESIGN

(2013-Credit Pattern) (Semester-III) (604202)

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

Instructions to the candidates:

1) ***Attempt any five out of eight.***
2) ***Figures to the right indicates full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) With the help of flow-chart explain the sequence of steps for ASIC design. **[5]**

b) Explain the various types of ASIC. What is importance of ASIC cell library? **[5]**

Q2) a) Write a VHDL code for sequence detector, which detects the sequence '1101' using moore machine. **[4]**

b) Explain the dataflow modeling style with the help of example. **[3]**

c) What is delta delay in VHDL? What is its significance? **[3]**

Q3) a) Explain the various parameters used for the static timing analysis. **[3]**

b) Draw & explain the H/W that will generate after synthesizing the following piece of code. **[4]**

```
Proc1: Process (x, y, z, sel)

variable v1, v2: std_logic;

begin
```

P.T.O.

```
if (sel = '1') then
    v1: = v2 AND y;
    v2: = v1 XOR z;
    Res: = v1 AND v2;
end if;
end process;
```

c) What are the different simulation modes in simulator. **[3]**

Q4) a) Explain mixed signal ASIC Design. **[4]**

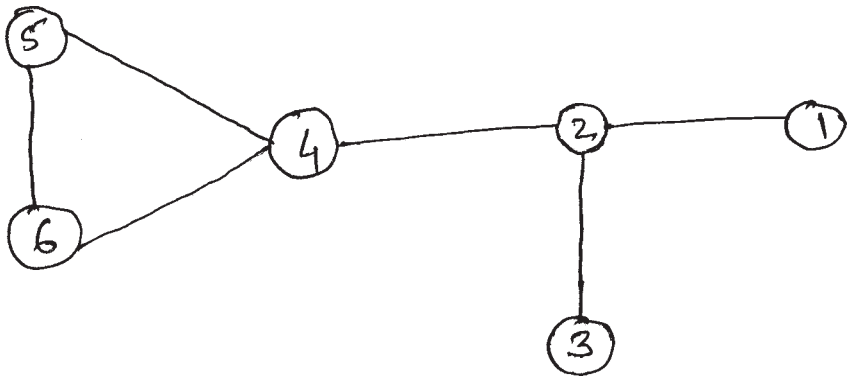
b) Explain the signal integrity effect in ASIC design. **[4]**

c) Explain the synthesis process in detail. **[2]**

Q5) a) Apply the K-L algorithm on the following system to improve the partitioning. Consider initial partition as: **[5]**

Partition A: Nodes 4, 2 and 3.

Partition B: Nodes 1, 5 and 6.



b) Classify the placement algorithms. Explain the min-cut algorithm with the help of example. **[5]**

Q6) a) Explain the constructive partitioning algorithm. **[4]**

b) What is detailed routing? Explain the left edge algorithm with the help of example. **[4]**

c) Explain the different global routing methods. **[2]**

Q7) a) Write short note on Any Two: **[4]**

i) Design Rule Check (DRC).

ii) Features of EDA tools.

iii) Fault simulation.

b) Explain the Built-in Self Test (BIST) with example. **[4]**

c) Define the terms: controllability and observability. **[2]**

Q8) a) Explain the ATPG algorithm in detail. **[4]**

b) Explain the different types of stuck-at fault models with the help of example. **[3]**

c) Briefly describe the boundry scan test. **[3]**

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Total No. of Questions : 8]

SEAT No. :

P4310

[Total No. of Pages : 3

[4860]-1261

M.E. (Electronics and Telecommunications) (Signal Processing)
IMAGE PROCESSING AND ANALYSIS
(2013 Credit Pattern) (Semester-I) (504401)

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

Instructions to the candidates:

1) ***Attempt any five questions out of eight.***
2) ***Figures to the right indicate full marks.***
3) ***Make suitable assumptions wherever necessary.***

Q1) a) Explain Connectivity and adjacency between the pixels. Where the concept of connectivity is used in Image Processing. Explain with suitable example. **[5]**

b) Define Illumination and reflectance. How the image function $f(x, y)$ is related to this? What is simultaneous contrast? **[5]**

Q2) a) Explain how the Laplacian mask is designed? Comment on the resultant image after applying Laplacian? Prove that crispened image can be obtained by convolving it with the following mask. **[5]**

0	–1	0
–1	5	–1
0	–1	0

b) Explain the procedure of image filtering in frequency domain. Compare the performance of ideal, Butterworth and Gaussian low pass and high pass filters in frequency domain. **[5]**

Q3) a) Explain in brief following estimation techniques of the degradation function in image restoration. **[4]**

i) By Experimentation.

ii) By Observation.

P.T.O.

b) A good deal of control can be gained over the illumination and reflectance components with a homomorphic filter. Justify. **[4]**

c) An 8 bit input image has to be enhanced by stretching gray level range [96, 169] by a factor of 2. The remaining gray levels observe identity transformation. Draw the gray level transformation function. **[2]**

Q4) a) Explain the encoding process in JPEG image compression. **[4]**

b) What is redundancy? Explain following redundancies used in image compression. **[4]**

i) Coding Redundancy.

ii) Psycho visual Redundancy.

c) Define Peak Signal to Noise Ratio (PSNR). How image quality is assessed using PSNR. **[2]**

Q5) a) What is Principal Component Analysis (PCA)? How PCA is used in image compression? **[4]**

b) Explain the algorithm for detecting threshold automatically in basic thresholding technique used in image segmentation. **[4]**

c) Explain in brief the local edge linking technique. **[2]**

Q6) a) Explain the role of structural element in morphological operations. Draw different structural elements. How they are selected? **[4]**

b) Explain conversion of RGB to HSI Colour space and vice versa. What is the significance of converting into HSI colour space? **[4]**

c) List various applications of image segmentation. **[2]**

Q7) a) What is chain code? With suitable example explain how chain codes are used in boundary representation. **[4]**

b) Apply ICFT to the following image

$$I = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}.$$ **[4]**

c) Explain intensity slicing based pseudo colouring technique. **[2]**

Q8) a) What is wavelet transform? How wavelets are used in signal decomposition? **[4]**

b) Explain different steps involved in Canny edge detection. **[4]**

c) Explain following interpolation techniques used in image zooming: **[2]**

i) Nearest neighbourhood.

ii) Bilinear.

●●●●●

Total No. of Questions :8]

SEAT No. :

P4311

[Total No. of Pages :3

[4860]-1262

M.E. (E & T/C) (Signal Processing)

SIGNAL PROCESSING TECHNIQUES

(2013 Credit Pattern) (Semester - I) (504402)

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

Instructions to the candidates:

1) ***Answer any five questions from 8 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***All questions carry equal marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) a) Using Bilinear Transformation, design low pass filter monotonic in passband and stopband, to satisfy following specifications of digital filter (sampling time = 0.2sec) **[5]**

$$0.8 \le H(e^{j\omega}) \le 1 \qquad 0 \le W \le 0.4\Pi$$
$$H(e^{j\omega}) \le 0.3 \qquad 0.7\Pi \le W \le \Pi$$

b) Why FIR filter provide linear phase? Justify with derivation. **[5]**

Q2) a) Design FIR High pass filter with cut-off frequency, $\pi/4$ rad / sample using Hanning window and length of filter = 11. **[5]**

b) Explain the application of multirate DSP in CD HI-Fi system and oversampling ADC. **[5]**

Q3) a) Design a 2-stage decimator that down-sample an audio signal by a factor of 30 with following specifications **[4]**

Input sampling frequency : 240 kHz

Highest frequency of Interest : 3.4 kHz

Passband ripple : 0.05

Stopband ripple : 0.01

P.T.O.

b) Starting with the steepest descent algorithm: $W_{k+1} = W_k - \mu\Delta_k$ where W_k is filter weight vector at discrete time k, μ is the step size and Δ_k is true gradient vector of error performance surface at discrete time k, derive LMS algorithm. State any reasonable assumption made. **[3]**

c) Explain, with suitable diagrams, the polyphase implementation of interpolators. **[3]**

Q4) a) Determine the coefficients of a linear phase FIR filter of length N=15 which has symmetric unit sample response and frequency response that satisfies the conditions. **[4]**

$$H\left(\frac{2\pi k}{15}\right) = 1 \quad for \quad k = 0,1,2,3$$
$$= 0.4 \quad for \quad k = 4$$
$$= 0 \quad for \quad k = 5,6,7$$

b) Explain MAC and Barrel shifter of DSP processor. **[3]**

c) What are the properties of folding. **[3]**

Q5) a) Find the pade approximation of second order to a signal $x(n)$ that is given by $\ddot{x}$ = [2, 1, 0, –1, 0, 1, 0, –1, 0, 1 .....]^T **[4]**

i.e. $x(0) = 2$, $x(1) = 1$ & so on.

with No. of zero (q = 2)

Number of poles (P = 2)

b) Explain different addressing modes of DSP processor. **[3]**

c) Derive the relation between analog and digital filter using impulse invariant transformation. **[3]**

Q6) a) Explain the use of Adaptive filter in system identification. **[4]**

b) Derive the expression for output spectrum of Decimator in terms of inpul spectrum and draw the spectrum. **[4]**

c) What are the limitations of least mean square method for filter designing. **[2]**

Q7) a) Explain the use of pipelining in digital signal processing with the help of fast Fourier Transform. **[4]**

b) Design a 2-stage interpolator which is used to increase sampling rule from 64kHz to 2048 kHz, with the following specification **[4]**

Passband ripple : 0.01

Stopband ripple : 80db

frequency band of interest : 0-30kHz.

c) Compare all methods of designing of FIR filters using frequency sampling method. **[2]**

Q8) a) What is use of unfold? Explain with example. **[4]**

b) The transfer function H(z) is given by $H(z)=\frac{1+0.5z^{-1}+0.3z^{-2}}{1+0.9z^{-1}+0.8z^{-2}}$ perform polyphase decomposition of H(z) in case of 2-section. **[3]**

c) IIR filters are always not stable? Justify. **[3]**

EEE

Total No. of Questions :8]

SEAT No. :

P4312

[Total No. of Pages :3

[4860]-1263

M.E. (E & T/C) (Signal Processing)

MIXED SIGNAL PROCESSING SYSTEMS AND DESIGN

(2013 Credit Pattern) (Semester - I)(504403)

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

Instructions to the candidates:

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

Q1) a) Derive the value of resistance emulated by a parallel Switched Capacitor. **[3]**

b) Draw the schematic of inverting switched capacitor amplifier and derive the expression for odd-even and even-even z-domain transfer function.**[4]**

c) Design a Switched Capacitor realization for a first order, high pass circuit with a high frequency gain of - 10 and a -3dB frequency of 1KHz using a clock of 100 KHz. **[3]**

Q2) a) Explain the influence non-idealities of Op-Amps on Switched Capacitor amplifiers. **[3]**

b) Describe the design of a low-Q bi-quad bandpass filter with an example. What is the significance of designing capacitor ratios in the design? **[4]**

c) Explain designs steps for higher order Switched capacitor filters using cascade approach. **[3]**

Q3) a) Draw the schematic of inverting switched capacitor amplifier and derive the expression for odd-even z-domain transfer function. **[4]**

b) Find $H^{oe}(z)$ of the Switched Capacitor circuit shown in Figure.Q1. Use clock phasing as given in the figure. **[4]**

P.T.O.

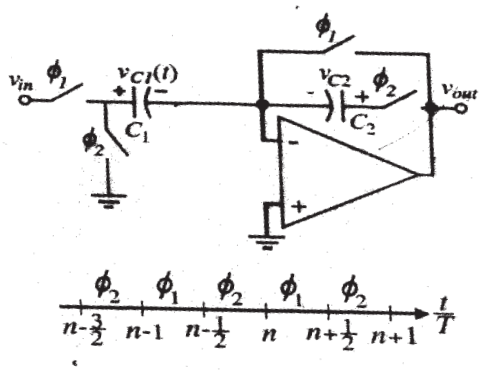


Figure Q.1

c) Compare positive and negative Switched Capacitor transresistance emulation of a resistor. **[2]**

Q4) a) Define the following analog to digital Converter specifications: SFDR, DNL, INL, Dynamic Range and Gain error. **[5]**

b) A 1V peak to peak sinusoidal signal is applied to an ideal 10-bit DAC, which has a V_{REF} of 5V. Find full scale (FS), full scale range (FSR) and maximum SNR of the digitized analog output signal. While the DAC was tested, it was found the actual SNR to be 50dB, find the Effective number of bits (ENOB). **[5]**

Q5) a) Determine the corresponding output voltage, V_{OUT} for 3-bit DAC designed using an R-2R ladder architecture for inputs $D_2D_1D_0$ = 011 and 111. Assume V_{REF} = 5V. **[3]**

b) Explain operation of a Serial DAC. Support your answer with a schematic and an example to demonstrate the conversion process. **[3]**

c) Explain voltage scaling DACs. What are the advantages of voltage scaling DACs. **[4]**

Q6) a) Explain the simple current mode S/H circuit. What are the conditions on φ_1 and φ_2 for good performance of the S.H circuit? **[4]**

b) Explain the static characteristics of an ADC. Derive signal-to-Noise Ratio (SNR) for an ADC. **[4]**

c) Compare Nyquist and Oversampling ADCs. **[2]**

Q7) a) Determine the number of stages, N in a current starved VCO with f_{centre} = 100MHz. Assume $L_n = L_p = 1$ and $W_p = 20$, I_D =10uA and V_{DD} = 1V. **[4]**

b) What are the applications of Phase Locked Loops? Explain digital PLL. **[4]**

c) What is frequency synchronization? How it is achieved in digital circuits? **[2]**

Q8) a) What is Direct Digital Synthesis? Elaborate the salient features of DDS system and briefly explain the applications. **[5]**

b) What is the need of locked-in Amplifier? Draw the block diagram of typical locked in amplifier. What is phase sensitive detection and narrow band detection? **[5]**

EEE

Total No. of Questions :8]

SEAT No. :

P4313

[Total No. of Pages :2

[4860]-1265

M.E. (E & T/C) (Signal Processing)

SPEECH SIGNAL PROCESSING

(2013 Credit Pattern) (Semester - II) (504407)

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) What is pitch? What are the different methods of pitch extraction? Explain any one method in detail. **[5]**

b) Explain with applications, the short-time features used in speech processing. **[5]**

Q2) a) How a given speech signal can be analyzed using cepstrum? **[5]**

b) Explain with block schematic, MFCC feature extraction process. **[5]**

Q3) a) A speech signal has a root mean square amplitude of 5V. The signal is to be coded using five bits. The signal density is assumed to be Laplacian. Find the step size, quantization noise power and SNR. **[4]**

b) Explain PCM and ADPCM. **[4]**

c) What do you mean by pre-emphasis? Why it is required in speech pre-processing? **[2]**

P.T.O.

Q4) a) What is the necessity of dynamic warping in template matching? Explain Dynamic Time Warping (DTW) in detail. **[4]**

b) How HMM can be used in speech recognition system? **[4]**

c) Discuss advantages and disadvantages of following speech enhancement methods. **[2]**

i) Spectral subtraction method.

ii) Adaptive noise cancellation.

Q5) a) How Levinson-Durbin algorithm can be used for solving a set of normal equations? **[4]**

b) How human speech perception system can be modeled by a filter bank? **[4]**

c) What is the relation between formants and LPC? **[2]**

Q6) a) Explain different methods of speech quality assessment. **[4]**

b) What is the necessity of speech enhancement? Which are the different methods used for speech enhancement? Explain any one method in detail. **[4]**

c) Discuss the differences between speech quality and speech intelligibility. **[2]**

Q7) a) Explain the digital model of speech production system. **[4]**

b) Discuss different quantization techniques. Why does a uniform quantizer not suitable for a speech signal? Explain how a non-uniform quantizer will avoid granular noise and slope overload distortions. **[4]**

c) State the features of LPC-10 coding standard. **[2]**

Q8) a) Write a note on text-to-speech synthesis. **[4]**

b) Explain the use of wavelet transform in speech analysis. **[4]**

c) Differentiate between speaker identification and verification. **[2]**

EEE

Total No. of Questions :8]

SEAT No. :

P4314

[Total No. of Pages :2

[4860]-1266

M.E. (E & TC) (Signal Processing)

ARCHITECTURES FOR SIGNAL PROCESSING ALGORITHMS

(2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

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

Q1) a) Find the output y(n) of an LTI System if impulse response h(n) = {1, 1, 1} and the input signal x(n) is x(n) = {3, -1, 0, 1, 3, 2, 0, 1, 2, 1} using overlap add and overlap save method. **[5]**

b) Explain the following properties of Discrete Fourier Transform. **[5]**

i) Circular Time Shift

ii) Circular Frequency Shift

Q2) a) Prove that the multiplication of two DFTs of two sequences is equivalent to circular convolution of two sequences in time domain. **[5]**

b) Write a short note on DSP application demands and scaled CMOS technologies. **[5]**

Q3) a) Explain minimum cycle mean algorithm with example. **[5]**

b) Consider a 2x3 linear convolution, **[5]**

$$s(p) = h(p)\ x(p)$$

where

$h(p) = h_0 + h_1 p,\ x(p) = x_0 + x_1 p + x_2 p^2$. Use the Cook-Toom algorithm to construct an efficient implementation for the given linear convolution.

P.T.O.

Q4) a) List the applications of unfolding. Explain any one in detail. **[4]**

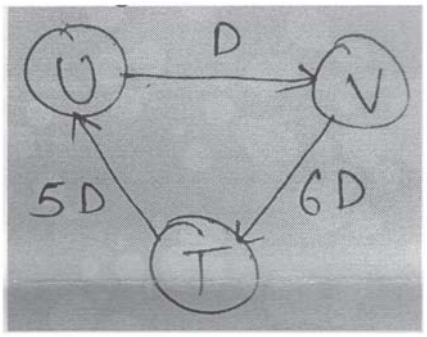
b) Explain properties of Unfolding. **[4]**

c) Explain Unfolding technique. **[2]**

Q5) a) What are the retiming techniques? Explain cutset retiming. **[4]**

b) Explain applications of folding. **[4]**

c) Draw 3 unfolded DFG for the given DFG. **[2]**



Q6) a) Explain carry save array multipliers. **[4]**

b) Explain with neat diagram Booth-Wallace Tree multiplier. **[4]**

c) Briefly explain CSD representation. **[2]**

Q7) a) Explain hybrid radix-2 addition and subtraction. **[4]**

b) Explain Integrated Convolution algorithm with the merit and demerit of it. **[4]**

c) Explain Galois field arithmetic for multiplication. **[2]**

Q8) Write short note on any two of the following: **[10]**

a) Bit serial FIR filter.

b) 4x4 carry save Baugh Wooley multiplier.

c) Parallel Multipliers.

EEE

Total No. of Questions :8]

SEAT No. :

P4315

[Total No. of Pages :2

[4860]-1267

M.E. (E & TC) (Signal Processing)

BIOMEDICAL SIGNAL PROCESSING

(2013 Credit Pattern) (Semester - II) (504409)

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

Instructions to the candidates:

1) ***Answers any five questions out of Q.1 & Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Discuss the various types of Bio-Potential Electrodes in details with diagram. **[5]**

b) Write a note on Blood flow. **[5]**

Q2) a) Discuss the Heart structure in details. **[5]**

b) Explain how is autocorrelation function helpful in finding periodicity in signals. **[5]**

Q3) a) Explain the origin of Bio-Potential. **[4]**

b) Explain active filter in detail. **[4]**

c) Explain power spectral density. **[2]**

Q4) a) What is the technique used to study fetal electro-cadiography. Explain the technique used. **[4]**

b) Draw Autocorrelation function for x(n) = [0, -1, 0.25, -1, 0.75, 0.25, -1,0,0.32] **[4]**

c) Explain Eigen functions of LSI system and Z-transform. **[2]**

P.T.O.

Q5) a) What is Noise Removal Technique. **[4]**

b) Explain biomedical application of Laplace Transform. **[4]**

c) Write a note on CT scan. **[2]**

Q6) a) Explain biomedical application of Fourier Transform. **[4]**

b) Write a note on EEG. **[4]**

c) Draw & explain Cell structure. **[2]**

Q7) a) Explain operating principle and specification of transducer. **[4]**

b) Discuss sonography technique in detail. **[4]**

c) What is characterization of signal in frequency domain. **[2]**

Q8) a) Discuss Weiner filter in detail. **[4]**

b) Distinguish FIR filter and IIR filter. **[4]**

c) Discuss Transient Protection. **[2]**

EEE

Total No. of Questions : 8]

SEAT No. :

P4316

[Total No. of Pages : 3

[4860]-1268

M.E. (E & TC) (Signal Processing)

STATISTICAL SIGNAL PROCESSING

(2013 Credit Pattern) (Semester - III)

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

Instructions to the candidates:

1) ***Answer any five questions from total 8 questions.***
2) ***Your are advised to attempt not more than 5 questions.***
3) ***Figures to the right indicate full marks.***

Q1) a) Explain in detail least square method of signal modelling and give it's advantages and disadvantages. **[5]**

b) Find the Pade's approximation of second order to a given signal *x(n)* given by

$$x = \left[\underset{\uparrow}{2},1,0,-1,0,1,0,-1,0,1.....\right]^{T}$$

Use approximation of the form

$$H(z) = \frac{b(0) + b(1)z^{-1} + b(2)z^{-2}}{1 + a(1)z^{-1} + a(2)z^{-2}}$$

Find the coefficients *b(0), b(1), b(2), a(1) & a(2).* **[5]**

Q2) a) Explain ARMA random process in detail. **[5]**

b) Autocorrelation values are given as $\gamma_{x(0)} = 26, \gamma_{x(1)} = 7, \gamma_{x(2)} = 7/2$ use Yule-Walker equation and develop ARMA (1,1) model for random processes *x(n)*. **[5]**

P.T.O.

Q3) a) What is significance of Yule - Walker equation & hence explain modified Yule-Walker equation. **[5]**

b) Given the autocorrelation sequence **[5]**

$\gamma_{x(0)} = 1 \quad \gamma_{x(1)} = 0.8$

$\gamma_{x(2)} = 0.5 \quad \gamma_{x(3)} = 0.1$

i) Find reflection coefficients $\lceil j$

ii) The model parameters $a_j(k)$

iii) Modelling error $\in_j$ for j = 1, 2, 3

using Levinson - Durbin recursion.

Q4) a) Derive Wiener hopf equation for causal FIR Wiener filter. Also give expression for minimum error interms of autocorrelation matrix R(x). **[5]**

b) Give the signal *x (n)* consisting of a single pulse of length N

x (n) =1 ; n = 0,1,2.....N-1

= 0 ; else

Use Prony's method to model *x (n)* as a unit sample response of Linear Shift Invariant filter having one pole and one zero. **[5]**

Q5) a) Explain periodogram as a non parametric methods of spectrum estimation. **[3]**

b) State & explain Cramer Rao lower bound. **[3]**

c) Explain MLE & state the asymptotic property of MLE. **[4]**

Q6) a) Write a short note on channel equalization using adaptive filter. **[3]**

b) Explain term minimum variance spectrum Estimation. **[3]**

c) Explain limitations of basic LMS algorithm based on following points.

i) Coefficient Drift ii) Effect of nonstationarity **[4]**

Q7) a) Explain RLS algorithm in detail. **[4]**

b) Write short note on shanks method. **[3]**

c) Explain

i) Bias ii) Resolution iii) Variance

w.r.t. Bartlett's method. **[3]**

Q8) a) Explain lattice filter structure implementation of FIR Wiener filter. **[3]**

b) Explain the term 'harmonic mean of reflection coefficient' in relation with Burg's Algorithm. **[3]**

c) How prediction and De convolution is carried out using a framework of Wiener filter. **[4]**

Total No. of Questions : 8]

SEAT No. :

P4604

[Total No. of Pages : 2

[4860]-1269

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) State the limitations of EZW algorithm. State the basic objectives of Set Partitioning in Hierarchical Trees (SPIHT) algorithm. Outline the steps of SPIHT encoding and decoding algorithm. **[5]**

b) Explain the importance of EBCOT used in JPEG 2000. Explain Tier-1 Coding. **[5]**

Q2) a) With the help of Block Diagram explain Baseline Sequential Mode Compression in JPEG. **[5]**

b) What are the major building blocks of JPEG-2000? Define tiling and its significance. **[5]**

Q3) a) Explain the following terms in relation to JPEG2000: Region of Interest and Scalability. **[5]**

b) Give the importance of Run length encoding and explain one method for the same for JPEG 2000. **[5]**

Q4) a) What is temporal Redundancy? How is it reduced by inter-frame coding? **[5]**

b) Give the need for Y-Cb-Cr color space and define differnt formats used for sampling. **[5]**

Q5) a) 'Scalability improves robustness in codec'. Justify the statement. **[5]**

b) What are the differences between MPEG2 and MPEG-1 video encoder? **[5]**

P.T.O.

Q6) a) Define video structure for MPEG1. **[5]**

b) In MPEG-1, with GOP structure N = 12 and M = 3, the maximum motion speed is assumed to be 15.5 pixels/frame (half pixel precision) calculate the number of search operations required to estimate the motion in P-pictures: **[5]**

i) Telescopic Method

ii) Direct on the P-pictures

Q7) a) Explain the need and types of Switched Multipoint functionalities of H.263. **[5]**

b) Explain techniques for error protection in H.263. **[5]**

Q8) a) What is Video Object Plane? How is it coded? **[5]**

b) Compare MPEG-4 with H.263. **[5]**

Total No. of Questions :8]

SEAT No :

P4317

[Total No. of Pages : 2

[4860] - 1270

M.E. (E/TC) (Communication Networks)

MODELLING AND SIMULATION OF COMMUNICATION NETWORKS

(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 electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain how simulation helps in performance studies of the Analytically intractable communication systems. **[5]**

b) Compare and contrast deterministic and stochastic simulations. **[5]**

Q2) a) What are the aspects for selection of sampling frequency for a simulation? Hence illustrate up sampling and down sampling with reference to simulation of a communication system. **[5]**

b) What is effect of fixed point and floating point arithmetic on quantization error? **[5]**

Q3) a) What are the different methods to map uniform random variables to an arbitrary pdf? Write an algorithm for generating a pair of Gaussian random vectors using the polar method. **[5]**

b) What are the various techniques to test random number generators? **[5]**
Compare and contrast the following algorithms.

i) Scatter plots

ii) Durbin-Watson Test.

P.T.O.

Q4) a) Why PN sequence generators are needed in simulation? What are its components? Also mention properties of a PN sequence? **[5]**

b) Illustrate the following graphical techniques used in typical simulation post processor with reference to $\pi/4$ DQPSK system. **[5]**

i) Waveform

ii) Eye-diagram

iii) Scatter Plot

Q5) a) Write an algorithm to estimate value of π using Monte Carlo integration. **[4]**

b) Compare and contrast pure Monte Carlo approach and semi-analytic approach to performance estimation of a communication system. **[4]**

c) Describe the situations when one will choose one of the following estimation routines based on the data generated by simulation process.**[2]**

i) Histogram.

ii) PSD

iii) Gain, Delay and Signal-to-Noise Ratio.

Q6) a) Write an algorithm for simple Monte Carlo simulation for BPSK Assuming: AWGN channel; Data symbols at source output are independent and equally probable; No pulse shaping performed at transmitter. **[5]**

b) What is semi analytic simulation technique? Hence write an algorithm for semi analytic BER estimation for QPSK. **[5]**

Q7) a) What are the empirical models based on swept tone measurement? Explain Poza's model in detail. **[5]**

b) What are the categories of a communication channel? What are the various specifications to be considered while simulating a radio channel? Hence elaborate multipath fading channel. **[5]**

Q8) a) Explain two state Markov model for discrete channel with memory. Write an algorithm to demonstrate the same. **[5]**

b) What are the different techniques used to reduce run-time of the Monte Carlo method? Hence explain importance sampling. **[5]**

Total No. of Questions :8]

SEAT No :

P4318

[Total No. of Pages : 2

[4860] - 1271

M.E. (E & TC) - Communication Networks

SPREAD SPECTRUM AND CDMA SYSTEMS

(2013 Credit pattern) (New) (Semester - I)

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

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Assume suitable data, if necessary***
3) ***Figures to the right indicates full marks.***
4) ***Use of calculator is allowed.***

Q1) a) What is Galois field? What are the properties of Galois field? **[5]**

b) Perform addition of a(x) = $1+x+x^3+x^5$ with b(x) = $1+x^2+x^3+x^4+x^7$ **[5]**

Q2) a) Write short note on convolution codes. **[5]**

b) Explain the multiple-dwell detector function with a flow chart or a state transition diagram. **[5]**

Q3) a) Explain the need of forward error correction and interleaver in spread spectrum communication system. **[6]**

b) Calculate the power spectrum for direct sequence spread spectrum transmitted signal when BPSK is used for both the data modulation and the spreading code modulation. Assume that the spreading code chip rate is 100 times the data rate, and the period of spreading code is infinite. **[4]**

Q4) a) Explain the basic principle of diversity. Explain the different diversity schemes. **[4]**

b) Write short note on block codes. **[4]**

c) Compare Direct Sequence and Frequency Hop spread spectrum system. **[2]**

P.T.O.

Q5) a) Explain the concept of cell splitting and cell sectoring in detail. **[4]**

b) Discuss the merits and demerits of CDMA digital cellular systems. **[4]**

c) What is the adaptive power control technique used in CDMA? **[2]**

Q6) a) With the help of conceptual block diagram, explain IS 95 CDMA digital cellular system. **[5]**

b) Describe Hybrid SFH TDMA/CDMA system for PCS applications. **[5]**

Q7) a) Explain the terms in brief: **[6]**

i) Special features of Network planning in CDMA.

ii) Need for radio resource management in CDMA.

b) Compare the IS-95, CDMA 2000 with reference to following points: **[4]**

i) System Capacity,

ii) Chip rate,

iii) Frequency Band,

iv) Channel Bandwidth and

v) Spectral Efficiency.

Q8) a) Compare the features of physical and logical channels of IS-95 with WCDMA. **[5]**

b) Write short note on EVDO & EVDV Systems. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4605

[Total No. of Pages : 3

[4860]-1272

M.E. (E&TC) (Communication Network)

DETECTION AND ESTIMATION THEORY

(2013 Credit Pattern)

Time : 2.½ 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) What is the interrelationship between auto correlation and spectral density. **[2]**

b) List out and define properties of Energy spectral density. **[4]**

c) Determine the cross correlation function for power signals given by

$x(t)=6\sin(12\pi t)$ and $y(t)=5\cos(12\pi t)$ **[4]**

Q2) a) A digital communication source Transmits symbols of 0's and 1's independently with probability 0.65 and 0.35 through noisy channel. At the receiver, symbols of 0's and 1's are obtained but with the chance that any particular symbol was garbled at the channel is 0.2 what is the probability of receiving zero and one? **[4]**

b) Define and classify types of random variables with their function. **[4]**

c) Find the characteristic function of the random variable X having density function $f_X(x)=e^{\frac{1}{2}|x|}$ for all x. **[2]**

`

Q3) a) Explain in detail the normal distribution of continuous random variables. **[5]**

b) For a given real random process $X(t)$ & $Y(t)$ define following terms: **[5]**

i) Mean value function

ii) Auto correlation function

iii) Jointly wide sense stationary

iv) Gaussian Process

P.T.O.

Q4) a) Define and brief properties of eigen values and eigen vectors in the application of signal processing. **[5]**

b) Explain the working operation of All pole AR (p) filter with neat diagram. List out its performance parameters. **[5]**

Q5) a) List and brief significance of four possible cases in binary hypothesis testing problem. **[2]**

b) Derive the expression for probability of error using Bayes criterion for Binary Hypothesis Testing. **[4]**

c) In a digital communication system, consider a source whose output under hypothesis H_1 and H_0 are a constant voltage, of value "a" and "zero". The received signal is corrrupted by N, an additive white gaussion noise of zero mean and variance = 0.5. Derive the likelihood ratio test and determine the decision regions. **[4]**

Q6) a) What is the difference between Bayes estimation and Maximum likelihood estimation? **[2]**

b) Derive the expression of minimum mean square estimator using Bayes estimation. **[4]**

c) The received signal under hypothesis H_1 and H_0 are given as :

$$H_1 : Y_k = m + N_k \quad k = 1, 2..M$$
$$H_0 : Y_k = \quad N_k \quad k = 1, 2..M$$

If the mean "m" is known but the variance σ^2 is unknown. Obtain maximum likelihood estimation of $\theta = \sigma^2$. **[4]**

Q7) a) Determine the minimum mean square error to obtain estimate of $s(t)$ in terms of present value $Z(t)$ for the observation process $Z(t) = S(t) + N(t)$. Assume $S(t)$ and $N(t)$ are zero mean wide sense stationary processes. **[4]**

b) Determine the minimum mean square error to estimate $Y(t)$ in the time interval $t \in [0, T]$ using the method of Interpolation. **[4]**

c) Classify and brief the significance of wiener filters. **[2]**

Q8) a) Derive an expression for decision making in correlation & matched filter receiver for general binary detection. **[4]**

b) With neat diagram, explain the working of optimum receiver for signals with random frequency. **[4]**

c) Explain the working of Basic RADAR in brief with block diagram for detection and location of objects. **[2]**

Total No. of Questions : 8]

SEAT No. :

P4319

[Total No. of Pages : 2

[4860]-1274

M.E. (E & TC) (Communication Networks)

TRAFFIC ANALYSIS AND QOS

(2013 Credit Pattern) (Semester - II) (504507)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of Calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain communication model in detail with neat diagram? **[4]**

b) Define & Explain network management system with neat diagram? **[4]**

c) What are the network management standards? **[2]**

Q2) a) Explain Conceptual Model for telecommunication network? **[4]**

b) Explain Optical and MAN feeder networks? **[4]**

c) Prepare a chart for functional roll of management tools? **[2]**

Q3) a) Write the short note on MPLS traffic Engineering? **[4]**

b) What is the SDH management? Also explain Broadband Network Management? **[4]**

c) Define & Explain TMN? **[2]**

P.T.O.

Q4) a) Explain communicational model? **[4]**

b) Explain network statistics? **[4]**

c) Explain Network management system design? **[2]**

Q5) a) Explain Telecommunication management network in terms of conceptual model & Standards. **[4]**

b) Explain High speed LAN performance, modeling & its estimation? **[4]**

c) What is the requirement of Fiber channel? **[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) Define congestion & Explain mechanism for congestion control? **[4]**

b) Explain Link level flow and error control? **[4]**

c) Explain cell Delay variation? **[2]**

Q8) a) Explain MPLS operation & OAM management? **[4]**

b) Explain TCP flow and congestion control? **[4]**

c) Explain QoS parameters define by ATM forum? **[2]**

Total No. of Questions : 8]

SEAT No. :

P4320

[Total No. of Pages : 2

[4860]-1275

M.E. (E & TC) (Communication Networks)

BROADBAND WIRELESS TECHNOLOGIES

(2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

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

Q1) a) Explain working of OFDM system with a suitable block diagram. Also indicate need of cyclic prefix and guard interval. How orthogonality is achieved in OFDM system? **[5]**

b) Discuss frequency selective fading channel in wireless communication system. **[5]**

Q2) a) Derive channel capacity for single input single output channels. Hence compare the capacity for AWGN channels and SISO Rayleigh fading channels. **[5]**

b) Explain the concept of Multiple Input Multiple Output OFDM transmitter and receiver. **[5]**

Q3) a) Compare and contrast time hopping UWB system and Multiple-time-hopping PPM UWB system forcontinuous transmission. **[5]**

b) How CSMA/CA MAC works? **[5]**

P.T.O.

Q4) a) Explain reservation MAC with reference to frame format for dynamic TDMA. Hence define: silent state, contention state and reservation state. **[5]**

b) Explain directional antenna MAC with necessary schematic. **[5]**

Q5) a) What is the importance of routing protocols in multi-hop networks? **[4]**

b) Compare and contrast Adaptive Routing Protocol and scalable Routing protocol. **[4]**

c) Explain multi-hop network with respect to multiple cells. **[2]**

Q6) a) Discuss salient features of WiMAX. **[5]**

b) Describe centralizedbandwidth scheduling and distributed bandwidth scheduling in WiMAX Mesh Network. **[5]**

Q7) a) How Quality of service is implemented for upstream and downstream in EPONS? **[5]**

b) Discuss different architectural consideration fo deployment of point to point FTTX. **[5]**

Q8) a) Explain any one integration architectures for EPON and WiMAX. **[5]**

b) What are the advantages of a WOBAN (wireless optical broadbandaccess network) over the wire-line optical and wireless networks? **[5]**

Total No. of Questions : 8]

SEAT No. :

P4321

[Total No. of Pages : 2

[4860] - 1276

M.E. (E & TC) (Communication Networks)

OPTICAL NETWORK

(2013 Credit Pattern) (Semester-II) (504509)

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

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***
4) ***Use of calculator is allowed.***

Q1) a) Draw a block diagram of a complete ON TX-TX system showing all components from a one customer to another customer, with one line explanation for each component. **[5]**

b) Write down design considerations for ON transmission system? **[5]**

Q2) a) Compare SONET, SDH and Optical Network? **[5]**

b) Explain new elastic optical networking paradigm describing the drivers, building blocks, architecture, and enabling technologies for this new paradigm. **[5]**

Q3) a) Write note on Solitons. **[4]**

b) Explain in detail second generation of optical network. **[4]**

c) Write down ON wavelength standards. **[2]**

Q4) a) Write and explain protocol stack alternatives for ON. **[4]**

b) What is the meaning of Optical backbone and what is the need of IP for it. **[4]**

c) Write four features of Internet transport optical network protocol stack. **[2]**

P.T.O.

Q5) a) Write down various Nonlinear Effects and explain in short each one of it. **[4]**

b) Compare crosstalk and dispersion. **[4]**

c) What is the need of wavelength converters? **[2]**

Q6) a) Write a note on Generic Framing Procedure (GFP). **[4]**

b) Compare the SONET and SDH multiplexing hierarchies. **[4]**

c) What is the need of multiplexing? **[2]**

Q7) a) Explain various ON network topologies. **[4]**

b) What is the significance of Erbium-doped Fiber (EDF). **[4]**

c) Write down different types of MPLS nodes. **[2]**

Q8) a) What is in-band and out-of-band control signaling. **[4]**

b) Explain traffic engineering What are the QOS parameters in MPLS traffic engineering. **[4]**

c) What is MPLS support of Virtual Private Networks (VPN), explain in short. **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4642

[Total No. of Pages : 2

[4860]-1277

M.E. (E & TC.) (Communication Networks) (Semester - III)

MOBILE COMPUTING

(2013 Pattern)

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

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Assume suitable data, if necessary.***
3) ***Figure to the right indicates full marks.***
4) ***Use of calculator is allowed.***

Q1) a) Discuss the evolution of various mobile generation technologies. **[5]**

b) Explain the significance of Co-channel interference reduction factor and frequency reuse scheme with respect to mobile technologies. **[5]**

Q2) a) Explain 802.16 Wi-Max architecture. **[5]**

b) Discuss call routing mechanism in GSM. **[5]**

Q3) a) Write note on mobile computing through Internet. **[4]**

b) Discuss GSM signaling Protocol architecture. **[4]**

c) Explain paging process in cellular technology. **[2]**

Q4) a) Discuss the benefits and features of 3G Mobile Technology. **[4]**

b) Explain the wireless sensor Network with schematic. **[4]**

c) What is mobile ad hoc network? **[2]**

Q5) a) Explain IP multimedia system architecture. **[4]**

b) Write note on VOIP system. **[4]**

c) Compare in brief Wi-Fi and 3G technology. **[2]**

P.T.O.

Q6) a) Discuss various types of handoffs in GSM. **[4]**

b) Explain GSM speech signal processing with necessary schematic. **[4]**

c) What is the difference between cell sectoring and cell splitting? **[2]**

Q7) a) Discuss various methods of providing privacy and security in wireless system. **[4]**

b) Write note on wireless security standards. **[4]**

c) Justify security and privacy needs for wireless system. **[2]**

Q8) a) Discuss how security is addressed in GSM. **[4]**

b) Explain Bluetooth architecture. **[4]**

c) Discuss with schematic, basic cellular system. **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4322

[Total No. of Pages : 2

[4860] -1278

M.E. (E & TC) (Communication Networks)
Digital Communication Receivers
(2013 Credit Pattern) (Semester-III) (604502)

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

Instructions to the candidates:

1) ***Answer any 5 Questions out of 8.***
2) ***Neat diagrams and waveforms must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Draw the line codes formats and PSD waveform for 11110000 and comments on power spectral density.

i) Dicode NRZ ii) NRZ iii) Delay modulation

iv) Bi-phase. **[4]**

b) Explain correlation Receiver & 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) Determine a set of orthonormal functions for the four signals given below. The signal $S_1(t)$ has energy $\in_1 = 2$. **[5]**

$S_1(t) = 1 \quad 0 \leq t \leq 2$

$= 0 \quad$ otherwise

$S_2(t) = 1 \quad 0 \leq t \leq 1$

$= -1 \quad 1 \leq t \leq 2$

$= 0 \quad$ otherwise

$S_3(t) = 1 \quad 0 \leq t \leq 2$

$= -1 \quad 2 \leq t \leq 3$

$= 0 \quad$ otherwise

$S_4(t) = -1 \quad 0 \leq t \leq 3$

$= 0 \quad$ otherwise

P.T.O.

Q3) a) State the various properties of matched filter. **[4]**

b) Derive the expression for output SNR of matched filter. **[4]**

c) Explain MAP criterion and ML criterion in optimum detector. **[2]**

Q4) a) What is small scale fading? Explain the factors influencing small scale fading. **[4]**

b) Explain fading effects due to i) multipath time delay spread and ii) Doppler Spread. **[4]**

c) Explain i) Coherence Bandwidth ii) Doppler Spread and iii) Coherence time. **[2]**

Q5) a) How symbol synchronization is achieved in binary PSK receiver. **[4]**

b) Explain Non-Decision-directed PLL for carrier phase estimation of PAM signals. **[4]**

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:

i) KALMAN algorithm for Adaptive Equalization.

ii) Stochastic gradient algorithm for Blind Equalization. **[4]**

b) Explain Early-Late Gate synchronizer in detail. **[4]**

c) Describe the adaptive Zero forcing Equalizer. **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4323

[Total No. of Pages : 3

[4860]-1279
M.E. (Electronics) (Digital Systems)
MICROELECTRONICS
(2013 Credit Pattern) (Semester - I) (504101)

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

Instructions to the candidates:

1) ***Solve any five questions.***
2) ***Figures to the right indicate full marks.***
3) ***Use of calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Design static CMOS logic circuit for the following expressions. **[5]**

i) $f = \overline{x_1} + \overline{x_2}.\overline{x_3}$

ii) $f = \overline{x_1} + \left(\overline{x_2} + \overline{x_3}\right).\overline{x_4}$

iii) $f = \overline{x_1 x_2 x_3 + x_4}$

b) Compare n-well, p-well and twin tub process. Draw and explain fabrication steps of CMOS inverter using twin tub process. **[5]**

Q2) a) What is Lithography? List various lithography techniques used in fabrication process. Explain photolithography process. **[5]**

b) Explain parasitic delay in CMOS VLSI circuit. Explain Elmore model for parasitic delay. **[5]**

Q3) a) What are the different causes of power dissipation in CMOS? Explain in brief. **[4]**

b) Compare CMOS and Bicmos technologies with respect to speed, Noise margin, power dissipation and input impedance. **[4]**

c) What is transmission gate? How it works? **[2]**

P.T.O.

Q4) a) List non-ideal I-V effects in MOS transistors and explain body effect and channel length modulation. **[4]**

b) Design a Full Adder using

i) Static CMOS logic.

ii) Pass transistor logic. **[4]**

c) Explain why PMOS devices are used as PUN and NMOS devices are used as PDN. **[2]**

Q5) a) Draw the stick diagram and layout of the following functions. **[4]**

i) Inverter ii) Two input NAND gate.

b) With the help of suitable diagram explain the regions of CMOS inverter. Discuss in detail device state in each region. **[4]**

c) Explain how to fabricate resistor and capacitor on CMOS IC. **[2]**

Q6) a) What is the effect of CMOS sizing on **[4]**

i) Propagation delay ii) C_{gs}

iii) $R_{DS(ON)}$ iv) Current sink/source capabilities.

b) Implement the following circuits using transmission gates: **[4]**

i) 2:1 multiplexer ii) 4:1 multiplexer.

c) What is mean by Lambda based design rule? **[2]**

Q7) a) Draw the CMOS circuit of positive edge triggered D Flip-Flop and explain its operation. **[4]**

b) Write short notes (Any 2) **[4]**

i) Layout design rule.

ii) Low power design techniques.

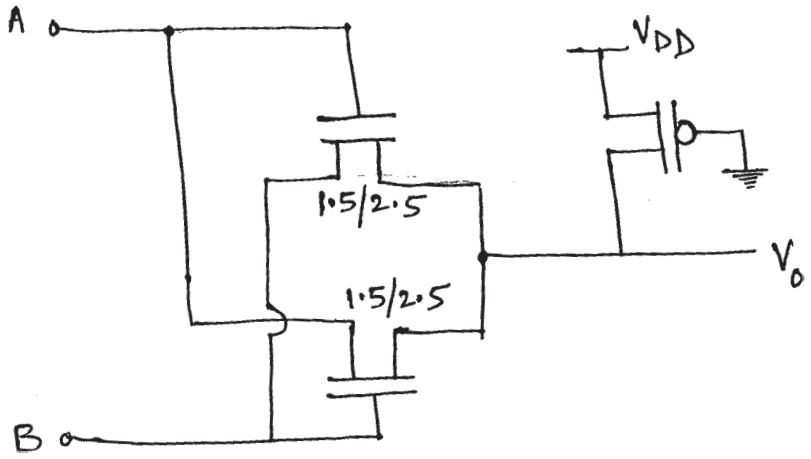
iii) Scaling in CMOS VLSI circuits.

c) What is the effect of beta ratio on VTC of CMOS Inverter. **[2]**

Q8) a) What are the components considered for the power dissipation in a CMOS VLSI circuit.

Calculate approximate dynamic power dissipation in a chip operating with V_{DD}=4.5 V at 100MHz with an internal switched capacitance of 500PF. **[4]**

b) Figure below contains a pass gate logic network **[4]**



i) What logic function does it implement?

ii) If the PMOS removed comment on the function of the circuit. Does the PMOS transistor serve any useful purpose?

c) Explain how CMOS inverter can be used as amplifier? **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4324

[Total No. of Pages : 2

[4860]-1280

M.E. (Electronics-Digital Systems)

DIGITAL SIGNAL PROCESSING ARCHITECTURES

(2013 Credit Pattern) (Semester-I) (504102)

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 scientific calculator is allowed.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if required.***

Q1) a) Explain Goertzel Algorithm with suitable equations. **[4]**

b) Compute 4-Point DFT of the following Sequence:

$X[n] = \{1, 2, 3\}$ **[3]**

c) Explain computational complexity of DFT with and without use of Radix-2 FFT algorithm. **[3]**

Q2) a) Why ideal low pass filter cannot be designed? Explain in detail. **[3]**

b) Determine impulse response $h(n)$ of a filter having ideal LPF frequency response as:

$$H_d(e^{jw}) = \begin{cases} e^{\frac{-j(M-1)\omega}{2}} & 0 \le \omega \le \pi/2 \\ 0 & ,\pi/2 \le \omega \le \pi, \end{cases}$$

where M = 7 **[4]**

c) Write a short note on mapping between S domain and Z domain. **[3]**

P.T.O.

Q3) a) Explain Polyphase Filter Structure with suitable diagram and equations. **[4]**

b) Explain the design of sampling rate converter for a factor of I/D = 3/4. **[3]**

c) What is a DCT? Discuss in short along with properties of DCT. **[3]**

Q4) a) What is code composer studio? Explain the use of CCS. **[4]**

b) Explain important features of TMS320C54 × DSP Processor along with block diagram. **[4]**

c) Explain the difference between fixed and floating point processor. **[2]**

Q5) a) Explain Booth's Multiplication Algorithm. **[4]**

b) Explain STFT. **[4]**

c) Explain computational complexity of DFT with and without use of Radix-2 FFT Algorithm. **[2]**

Q6) a) Determine the linear convolution using circular convolution for the given two sequences

$X(n) = (2, 3, 1, 1)$ and $h(n) = (1, 3, 5, 3)$ **[5]**

b) Explain FIR filter design using Windowing Technique, which window is the best and why? **[5]**

Q7) a) Write a short note on wavelet Transform and explain concept of mother wavelet. **[5]**

b) Explain Overlap and save method for filtering long length sequences. **[5]**

Q8) a) How will you make use of program cache for efficient implementation on FIR filter? **[4]**

b) Explain in detail the frequency spectrum at the output of each block in a decimator. **[4]**

c) What is the difference between: **[2]**

i) Upsampler and Interpolator.

ii) Downsampler and Decimator.

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Total No. of Questions : 8]

SEAT No. :

P4325

[Total No. of Pages : 2

[4860]-1281

M.E. (Electronics) (Digital Systems)

EMBEDDED SYSTEM DESIGN

(2013 Credit Pattern) (Semester-I) (504103)

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

Instructions to the candidates:

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

Q1) a) Explain Embedded system architecture & its aspects in detail. What are the different categories of embedded system? **[4]**

b) Define design metrics. Explain **[4]**

i) Time to market.

ii) NRE cost.

c) Explain the advantages and disadvantages of system on chip. **[2]**

Q2) a) Discuss in detail spiral type life cycle model with its advantages, disadvantages and applications. **[4]**

b) Write a short note on various development tools used in Embedded system design. **[4]**

c) Differentiate Functional model and Architectural model. **[2]**

Q3) a) Explain with block diagram & specifications ARM-9-TDMI processor. **[4]**

b) Explain the architectural support provided in ARM processor for development. **[4]**

c) Explain the AMBA bus architecture. **[2]**

P.T.O.

Q4) a) Explain in details memory hierarchy & memory subsystem architecture. **[4]**

b) Write a note on I2C & SPI protocol. **[4]**

c) Explain JTAG boundary scan organization. **[2]**

Q5) a) Explain Embedded Linux System architecture. **[4]**

b) What is the role of boot loader? Explain process of boot loading. **[4]**

c) What is the function of system call interface in Linux. **[2]**

Q6) a) What are different types of device drivers? Explain any one with reference to embedded Linux. **[4]**

b) Explain porting of Linux on ARM9 microcontrollers. **[3]**

c) What do you mean by kernel initialization? **[3]**

Q7) a) Explain Android architecture structure in details. **[4]**

b) What do you meant by Manifest in Android OS? **[3]**

c) Explain in detail advance operations with Android like telephony & SMS. **[3]**

Q8) a) Explain various network services support provided by Android OS. **[4]**

b) Write short note on APIs and content providers with reference to Android OS. **[4]**

c) Describe various applications of Android. **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4563

[Total No. of Pages : 2

[4860]-1283

M.E. (Electronics) (Digital Systems)

DESIGN FOR TESTABILITY

(2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

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

Q1) a) Design a sequence generator in which output Y is '1' only if input sequence of 1001 occurs at consecutive clock pulses, otherwise Y = '0'. **[4]**

b) Implement the following function with 3 input LUT using shannon's expansion. **[4]**

$$f = \overline{w}_2 w_3 + \overline{w}_1 w_2 \overline{w}_3 + w_2 \overline{w}_3 w_4 + w_1 \overline{w}_2 \overline{w}_4$$

c) Implement the function $f = w_1 \oplus w_2$ using single 2:1 Multiplexer. **[2]**

Q2) a) Write truth table of 4-to-2 Priority encoder, also write efficient VHDL code to describe this truth table. **[4]**

b) Using generate statement write a program of 16 to 1 multiplexer using 2 to 1 multiplexer. **[4]**

c) Give VHDL arithmetic operators which can be synthesize. **[2]**

Q3) a) Write a VHDL code using CASE to design a mealy machine for z=1 for second occurrence of x=1 else 0. **[4]**

b) Design Moore type FSM for serial adder. **[4]**

c) Give the steps involve in design step FSM using CAD tool. **[2]**

P.T.O.

Q4) a) What are static Hazards? Explain the methods to eliminate these Hazards. **[4]**

b) Write a short note on need of Design for Testability. **[4]**

c) Explain Metastability in short. **[2]**

Q5) a) Design a serial adder using Mealy machine. **[4]**

b) Draw and explain the data path circuit for shift and add multiplier. **[4]**

c) Explain switch debouncing. **[2]**

Q6) a) What is SRAM cell? Design 2 × 2 array of SRAM cell and explain its operation. **[5]**

b) Explain the Bit counting circuit using pseudo code and ASM chart. **[5]**

Q7) a) What is clock skew? What are the possible problems caused by clock skew? What are remedies? **[4]**

b) Explain H-Tree clock distribution network. Why is it required? **[4]**

c) Define Set up time and Hold time. **[2]**

Q8) a) What is Boundary Scan Technique? Explain its application with neat diagram. **[5]**

b) Draw and explain Built in logic block observer. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4606

[Total No. of Pages : 2

[4860]-1284

M.E. (Electronics - Digital Systems)

PLDs AND ASIC DESIGN

(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Solve any five quetions.***
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) Why FPGAs are often used to implement pipelining effectively? **[4]**

b) Explain the state diagram optimization. **[4]**

c) Write a note on System on Chip. **[2]**

Q2) a) Explain the resource sharing in a system design with suitable example. **[4]**

b) Explain the Complex Programmable Logic Device MAX-7000. **[4]**

c) What is the passive process? **[2]**

Q3) 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]**

Q4) a) What are the different examinations are carried out in the static timing analysis. **[4]**

b) Describe the concurrent statement and sequential statement in VHDL with suitable example of each. **[4]**

c) Explain the difference between simulation and synthesis. **[2]**

Q5) a) Write logic implementation block in FPGA architecture. Explain Spartan II CLB. **[5]**

b) Explain the significance of the Std_Logic_1164.all pakage and numeric_std.all package available in library IEEE. **[5]**

P.T.O.

Q6) a) Explain any two types of Mask Gate Arrays. **[4]**

b) Describe the three phases in the simulation of VHDL code. **[3]**

c) Explain different programming technologies used to configure FPGAs. **[3]**

Q7) a) Explain the ASIC design flow with neat diagram. **[4]**

b) Write a note on ASIC Cell libraries. **[4]**

c) Explain the hardware and software codesign. **[2]**

Q8) 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]**

Total No. of Questions : 8]

P4657

SEAT No. :

[Total No. of Pages : 2

[4860] - 1285

M.E. (Electronics) (Digital Systems)

RANDOM SIGNALS & PROCESSES

(2013 Credit 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) ***Assume suitable data if necessary.***

Q1) a) Derive the expression between likelihood ratio and the threshold for binary hypothesis testing. **[5]**

b) Explain in brief the Bayes estimation and its related cost functions. **[5]**

Q2) a) Describe Cramer - Rao bound on the error variance to find goodness of estimator. **[5]**

b) Explain the significance of maximum a posteriori estimate in minimising the risk function. **[5]**

Q3) a) List out and brief the properties of correlation functions of random process. **[4]**

b) Define power density spectrum and list down its properties in detail. **[4]**

c) What is relation between power density spectrum and auto correlation. **[2]**

Q4) a) Define the following terms w.r.t. random processes: **[4]**

i) Ensemble

ii) Expectations

iii) Wide-sense stationary process

iv) Ergodicity

b) Describe in detail to obtain power spectrums of discrete time processes. **[4]**

c) Classify and explain in brief random processes. **[2]**

P.T.O.

Q5) a) Define and explain central limit theorem. **[2]**

b) Explain in detail poisson distribution. Given the following information. **[4]**

No. of deaths	0	1	2	3	4
Frequency	112	50	18	2	1

Fit a poisson distribution to above data.

c) Explain following terms of random variable. **[4]**

i) Moments ii) Centre moments

iii) Skew iv) Kurtosis

Q6) a) The joint probability function of two random variables X and Y is given by

$f(x,y) = C[2x + y^2]$ $x = 1, 2, 3, 4$ $y = 0, 1, 2$

$= 0$ otherwise

Find marginal probability functions of "X" and "Y". **[4]**

b) Define Bayes theorem. A town has a population of 8,000 peoples. Of these, 5,000 are males and 3,000 are females. Also 150 males and 250 females of this population are unemployed. An unemployed person is chosen at random. What is the probability that he is a female. **[4]**

c) What is the difference between Chi Square and K-S test. **[2]**

Q7) a) Explain and classify probabilities. **[4]**

b) Classify probability distributions. Explain in detail a continuous probability distribution function. **[4]**

c) Five coins whose faces are marked 2,3 are thrown, what is the chance of obtaining a total of 12? **[2]**

Q8) a) Explain with neat expression Neyman - Pearson test for binary hypothesis testing. **[4]**

b) Explain permutations and combinations quantitative technique. In how many ways can four persons be chosen out of seven. **[4]**

c) Define binary hypothesis test in detection of signals. **[2]**

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Total No. of Questions : 8]

SEAT No. :

P4326

[Total No. of Pages : 2

[4860]-1286

M.E. (Electronics) (Digital Systems)

IMAGE PROCESSING AND COMPUTER VISION

(2013 Credit Pattern) (Semester-III) (604101)

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) Apply 3 × 3 averaging filter and median filter to the following image with zero padding. **[5]**

150	150	10	150	150
150	80	10	80	150
150	80	200	80	150
150	80	10	80	150
150	150	10	150	150

b) Explain in detail the different point processing techniques used for image enhancement. **[5]**

Q2) a) With the help of block diagram explain predictive lossy compression technique. **[5]**

b) With the help of examples explain 4-, 8-, and m-connectivity. **[5]**

Q3) a) Define gradient vector? Explain the gradient operators such as Robert's cross gradient, Sobel operator, Prewitt operator. **[5]**

b) Explain the steps in Canny edge detection. **[5]**

P.T.O.

Q4) a) Define forward and inverse 2D DCT and mention its properties. **[5]**

b) Explain image thresholding. Explain the global and adaptive thresholding. **[5]**

Q5) a) Explain Marr's top down approach for 3D computer vision. **[5]**

b) What are the different types of co-ordinate systems used for analysis of 3D vision? Draw diagram. **[5]**

Q6) a) Write short note on correlation base stereo correspondence. **[5]**

b) State an algorithm to extract shape from shading. **[5]**

Q7) a) What are the difficulties for 3D vision using intensity images as input. **[5]**

b) Write a note on Intrinsic & Extrinsic parameters of the camera. **[5]**

Q8) a) Estimate fundamental matrix from image point correspondences. **[4]**

b) With reference of Radiometry and 3D vision explain the following terms: **[6]**

i) Radiometry consideration in gray level.

ii) Surface reflectance.

iii) Photometric stereo.

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Total No. of Questions : 08]

SEAT No. :

P4607

[Total No. of Pages : 2

[4860] - 1287

M.E. (Electronics) (Digital System)

Wireless and Mobile Technologies

(Semester - III) (2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) Explain the fading effects due to multipath time deloy spread and Doppler spread. **[5]**

b) Explain the Doppler shift with the help of figure. In a digital cellular system, if fc = 900 MHz and the mobile velocity is 60 km/hr. Calculate the received carrier frequency if the mobile **[5]**

i) Directly towards the transmitter

ii) Directly away from the transmitter and

iii) In a direction perpendicular to the direction of the arrival of the transmitted signal.

Q2) a) Explain static and dynamic channel allocation schemes in cellular communication. **[5]**

b) Explain importance of cellular topology in mobile communication. Explain the method of locating co-channel cells in a cellular system with suitable example. **[5]**

Q3) a) Explain how a multiple access collision avoidance can avoid the problem of hidden terminal and exposed terminal. **[4]**

b) With the help of a neat diagram explain spread Aloha multiple access. **[4]**

c) Explain in brief inhibit sense Multiple Access. **[2]**

P.T.O.

Q4) a) Explain why very common MAC scheme CSMA/CD from wired network fails in a wireless scenario. **[4]**

b) Explain PRMA packet reservation multiple Access. **[4]**

c) What is slotted Aloha? **[2]**

Q5) a) What is triangular routing? Explain a way to optimise the routing with a neat diagram. **[4]**

b) Explain Mobile TCP. State its advantages. **[4]**

c) Compare destination sequence distance vector with distance vector algorithm. **[2]**

Q6) a) Explain with the help of diagram the mobile IP packet delivery to and from the mobile node. **[3]**

b) What is tunneling and encapsulation? **[3]**

c) Explain snooping TCP. **[4]**

Q7) a) Draw GSM protocol architecture for signaling and explain it. **[4]**

b) Explain with neat diagram mobile originated call operation in GSM. **[3]**

c) Explain in brief the security services offered by GSM. **[3]**

Q8) a) What is the additional mechanism in IEEE 802.11 standard to deal hidden node problem? explain. **[4]**

b) Explain GSM TDM frame, slots and bursts with neat diagram. **[3]**

c) Explain the similarities between HIPERLAN-1 and IEEE 802.11. **[3]**

Total No. of Questions : 8]

SEAT No. :

P4327

[Total No. of Pages : 2

[4860]-1288
M.E. (Production) (CAD/CAM)
COMPUTER AIDED DESIGN
(2013 Credit Pattern) (Semester-I) (511301)

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) ***Q. 7 and Q. 8 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) Define Explicit, Implicit and parametric representation of geometrical entities and their advantages and disadvantages. **[5]**

OR

Q2) 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]**

Q3) What is Homogeneous Coordinate System? Explain the necessity of Homogeneous Coordinate System for transformation of geometric entities using suitable examples. **[5]**

OR

Q4) Differentiate between Forward Engineering and Reverse Engineering. **[5]**

Q5) The coordinates of four control points are given by V_0 = [2, 2, 0], V_1 = [2, 3, 0], V_2 = [3, 3, 0], V_3 = [3, 2, 0]. Find the equation of Bezier curve, find the points on the curve for t = 0, ¼, ½, ¾ and 1, also plot the curve for the given data. **[7]**

OR

P.T.O.

Q6) Explain various types of surface entities. Derive parametric equation of analytical surface models. **[7]**

Q7) a) Discuss in brief the basic elements of CSG model. Explain the main building operation of CSG scheme with examples. **[8]**

b) What is Z-buffer algorithm for B-REP and CSG model? **[7]**

Q8) Write short note on Any Three: **[18]**

a) Visual Realism.

b) Types of animations.

c) Parametric programming.

d) CAD/CAM integration.

e) Hidden line removal algorithm.

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Total No. of Questions : 6]

P4644

SEAT No. :

[Total No. of Pages : 1

[4860] - 1289
M.E. (Production) (CAD/CAM)
COMPUTER AIDED MANUFACTURING
(2013 Pattern)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, and Q5 & Q6 are compulsory.***
2) ***Assume suitable data if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain various features of CNC systems. **[5]**

b) Explain principle of ball screw in CNC machines. **[5]**

OR

Q2) What do you mean by APT; Explain it with suitable example. **[10]**

Q3) a) Explain CNC-EDM. **[5]**

b) Write short note on various types of AGV's used for material handling. **[5]**

OR

Q4) a) Explain principle of automated welding process with block diagram. **[5]**

b) Explain automated storage and Retrieval system with its components. **[5]**

Q5) a) Which are the methods for in process automated inspection? Explain in short. **[7]**

b) Explain contact and non-contact method of inspection. **[8]**

Q6) a) What are the factories of future? Explain in short and role of human in it. **[9]**

b) What is digital manufacturing. **[6]**

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Total No. of Questions : 6]

SEAT No. :

P4328

[Total No. of Pages : 2

[4860]-1290

M.E. (Production) (CAD/CAM)

ADVANCED MATHEMATICS AND STATISTICS

(2013 Credit Pattern) (Semester-I) (511303)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer 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 $3x^2+5y^2+3z^2-2yz+2zx-2xy$ to the canonical form and specify the matrix of transformation. **[8]**

b) Solve the variational problem $\int_1^2 \left[(x^2(y')^2+2y(x+y)\right]dx$, with $y(1)=y(2)=0$. **[8]**

OR

Q2) a) Show that the transformation

$$y_1 = x_1 - x_2 + x_3$$

$$y_2 = 3x_1 - x_2 + 2x_3$$

$$y_3 = 2x_1 - 2x_2 + 3x_3$$

is regular, write down the inverse transformation. **[8]**

b) Solve the boundary value problem $y''+y+x=0(0\le x\le 1),\ y(0)=y(1)=0$ by Galerkin's method. Compare your solution with the exact solution. **[8]**

Q3) a) Show that the Fourier transform of $f(x)=e^{\frac{-x^2}{2}}$ is $e^{\frac{-s^2}{2}}$. **[9]**

b) Solve the Laplace equation $y''-2y'-8y=0$ with $y(0)=3$ and $y'(0)=6$. **[8]**

OR

P.T.O.

Q4) a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$, subject to the conditions

$$u(0,\ y)=u(l,\ y)=u(x,\ 0)=0,\ u(x,\ a)=\sin\left(\frac{n\pi x}{l}\right).$$ **[9]**

b) Solve the integral equation:

$$\int_0^\infty f(x)\cos px\,dx=\begin{cases}1-p, 0\le p\le 1\\ 0\quad ,\quad p>1\end{cases}$$

Hence deduce that $\int_0^\infty \frac{\sin^2 t}{t^2}dt=\frac{\pi}{2}$. **[8]**

Q5) a) Discuss the static variable model and its advantages over differential equation model. **[8]**

b) A random variable x has the following Probability function values of x. **[9]**

x :	0	1	2	3	4	5	6	7
$p(x)$:	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

i) Find k.

ii) Evaluate $P(x<6), P(x\ge 6), P(0<x<5)$.

OR

Q6) a) Describe in brief types of simulation approaches. **[8]**

b) The height of six randomly chosen sailors are (in inch): 63, 65, 68, 69, 71, 72. Those of 10 randomly chosen soldier's are 61, 62, 65, 66, 69, 69, 70, 71, 72, 73. Discuss the light that these data thrown the suggestions that sailors are on the average taller than soldier's. **[9]**

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Total No. of Questions : 6] SEAT No. :

P4680 [Total No. of Pages : 1

[4860] - 1291
M.E. (Production) (CAD/CAM)
DESIGN OF EXPERIMENTS & RESEARCH METHODOLOGY
(2013 Credit Pattern)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates :

1) ***Answer Q1 OR Q2, Q3 OR Q4, and Q5 & Q6 are compulsory.***
2) ***Assume suitable data, if necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain in brief difference between mathematical research and experimental research. **[5]**

b) Briefly describe the different steps involved in a research process. **[5]**

OR

Q2) Explain following in brief : **[10]**

a) Problem solving process.

b) Brain Storming and Delphi method.

Q3) a) Explain simulation in terms of Meaning, Application and Classification of Models. **[5]**

b) Explain process of formulation of model based on simulation. **[5]**

OR

Q4) Write short notes on : **[10]**

a) Steps in Design of Experiments.

b) Errors in Experiments.

Q5) a) What do you mean by Robust Design? Explain it in brief. **[7]**

b) Explain Taguchi Approach to Parameter Design. **[8]**

Q6) Write short notes on : **[15]**

a) Steps involved in report writing.

b) Principles of Thesis Writing.

Total No. of Questions : 8]

SEAT No. :

P4329

[Total No. of Pages : 2

[4860]-1292

M.E. (Production) (CAD/CAM)

COMPUTER INTEGRATED MANUFACTURING

(2013 Credit Pattern) (Semester-II) (511307)

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) ***Q. 7 and Q. 8 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]**

OR

Q6) Which are the typical sensors that are normally used in robot? Explain. **[7]**

P.T.O.

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. :

P4330

[Total No. of Pages : 2

[4860]-1293

M.E. (Production - CAD/CAM Engineering)

FINITE ELEMENT ANALYSIS

(2013 Credit Pattern) (Semester-II) (511308)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Q. No. 5 and Q. No. 6 are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of non programmable calculator is allowed.***
5) ***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]**

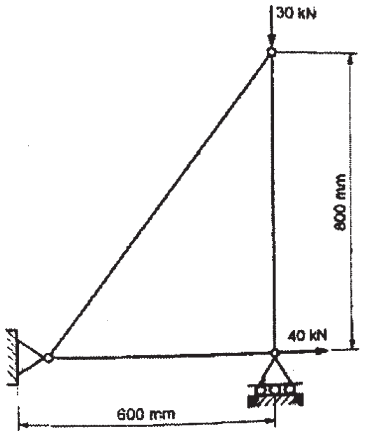
OR

Q2) a) Explain the properties of global stiffness matrix 'K'. What is banded or skyline matrix. **[5]**

b) State the convergence requirements of shape functions. **[5]**

Q3) a) Explain in brief different types of elements used in finite element formulation. **[4]**

b) For the three-bar truss shown in figure below. Determine the nodal displacement and stress in each member. Find the support reactions also. Take E = 200 GPa, Area = 50 mm^2. **[6]**

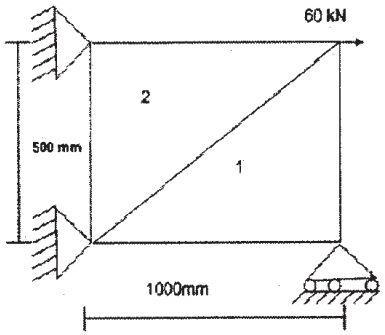


OR

P.T.O.

Q4) a) Determine shape function for CST element in terms of natural co-ordinate systems. **[4]**

b) A 2D plate loaded is shown in figure. Determine the displacements of nodes using the plane stress condition. Ignore body forces. Thickness 10 mm, E = 200 GPa & μ = 0.3. **[6]**

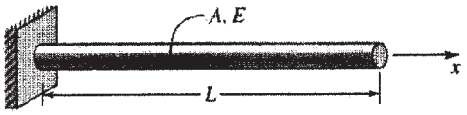


Q5) a) Derive the element stiffness matrix and stress vector for frame element. **[8]**

b) Derive expression for consistent load which varies linearly from P_1 at node 1 to P_2 at node 2 on a beam element of length 1_e. **[7]**

Q6) a) Explain Hamilton's principle along with derivation for equilibrium. **[7]**

b) Using two equal length finite elements, determine the natural circular frequencies of the solid circular shaft fixed at end as shown in figure below. **[8]**



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Total No. of Questions : 08]

SEAT No. :

P4608

[Total No. of Pages : 2

[4860] - 1294
M.E. (Production) (CAD/CAM)
OPTIMIZATION TECHNIQUES
(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) What do you mean by optimal control problem? Explain with suitable example. **[4]**

b) Find the dimensions of the cylindrical tin (with Top and bottom) made up of sheet metal to maximize its volume such that total surface area is equal to 24π. **[4]**

c) Define Pareto optimal solution. **[2]**

Q2) a) Minimize the function $f(x) = x(x - 1.5)$ in the interval (0, 1) using Exhaustive search method to within 10% of the exact value. **[6]**

b) Draw a flowchart of golden section method for one dimensional minimization problems. **[4]**

Q3) a) Using pattern search method, perform one iteration to minimize the function $f(x) = x_1 - x_2 + 2x_1^2 + 2x_1.x_2 + x_2^2$ Assume initial point as (0, 0). **[4]**

b) Explain steepest descent method for multi-variable optimization. **[4]**

c) Write advantages of random search method. **[2]**

P.T.O.

Q4) Write short notes on :

a) Quadratic interpolation method. **[5]**

b) Evolutionary optimization method. **[5]**

Q5) a) Calculate function 'ϕ' for optimization problem given below using interior penalty method. Consider penalty parameter 'r' = 100. **[6]**

Min $f(x) = 3x_1^2 + 2x_2^2$

Subject to : $g_1(x) = 1 - x_1 - x_2 \leq 0$

$g_2(x) = x_1 \geq 0$

b) Discuss the algorithm for exterior penalty function method. **[4]**

Q6) a) Explain application of artificial neural networks in computer aided design. **[4]**

b) Calculate the accuracy of the variables for minimizing the function $f(x) = x_1^2 + x_2^2$ with $1 \leq x_1, x_2 \leq 5$ using genetic algorithm if string length for each variable used is 4? **[4]**

c) What is elite count in genetic algorithm? **[2]**

Q7) a) Explain Modeling Return-On-Investment (ROI) in TOC. **[4]**

b) Write internal constraints in theory of constraints. **[2]**

c) Explain application of theory of constraints in operations management. **[4]**

Q8) Write short notes on :

a) Steps in simulated annealing algorithm. **[5]**

b) Priori approach for Multi-objective optimization. **[5]**

Total No. of Questions : 06]

SEAT No. : ____

P4609

[Total No. of Pages : 2

[4860] - 1295

M.E. (Production Engineering) (CAD/CAM)

ADVANCED STRESS ANALYSIS

(2013 Credit Pattern) (Semester - III)

Time : 2 Hours] ***[Max. Marks :50***

Instructions to the candidates:

1) ***Question 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) Explain stress deviator tensor and its invariants. Express von Mises stress in terms of second invariant of stress deviator tensor. **[10]**

OR

Q2) Determine the stress fields that arise from the following stress functions :

a) $\varphi = Cy^2$

b) $\varphi = Ax^2 + Bxy + Cy^2$

c) $\varphi = Ax^3 + Bx^2y + Cxy^2 + Dy^3$

where A, B, C and D are constants. **[10]**

Q3) Explain with sketch an experimental stress analysis using Brittle coat method. **[10]**

OR

Q4) Using castigliano's theorem, determine the deflection of point A of the step shaft as shown in figure 1. The second-area moment of the beam between point A and B is I_1, and from B to C the second-area moment is $I_2=2I_1$, The entire beam is made of a material with modulus of elasticity of E. **[10]**

P.T.O.

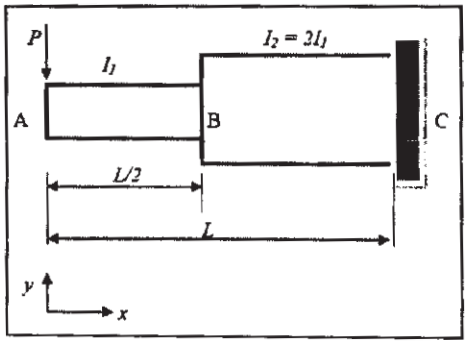

Figure 1(Shaft fixed at end C)

Q5) a) Consider an unnotched specimen with an endurance limit of 255 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 115 MPa. **[10]**

i) Solve by reducing S'_e.

ii) Solve by increasing the applied stress tals.

b) Write note on conformal mapping. **[5]**

Q6) a) Consider a flat plate of some metal alloy that is to be exposed to repeat tensile compressive cycling in which the mean stress is 25 MPa. If a_o = 0.25 mm, a_c = 5.0 mm, m = 4.0, A = 5 * 10^{-15}, Y = 2.0, and $N_f = 3.2 * 10^5$ cycles calculated using relation. **[10]**

$$\frac{1}{A\pi^{m/2}(\Delta\sigma)^m}\int_{a_0}^{a_c}\frac{da}{Y^m a^{m/2}}$$

Estimate the maximum tensile stress to yield the fatigue life prescribed.

b) Write note on fatigue crack initiation and propagation. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4331

[Total No. of Pages : 2

[4860]-1296

M.E. (Production) (CAD/CAM)

COMPUTER AIDED PRODUCTION PLANNING

(2013 Credit Pattern) (Semester-III) (511314)

Time : 2 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) ***Q. 7 and Q. 8 are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat self-explanatory sketches wherever necessary.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Discuss different measures of forecast errors. **[5]**

OR

Q2) Explain ALDEP use in facility planning. **[5]**

Q3) Discuss use of quadratic assignment model adding new machines to existing facility. **[5]**

OR

Q4) Discuss GT benefits and limitations. **[5]**

Q5) Discuss ERP implementation issues. **[7]**

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]**

P.T.O.

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) MRP II.

b) CDS algorithm for sequencing.

c) Software for ERP.

d) Gantt chart.

e) Random number generation.

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Total No. of Questions : 8]

SEAT No. :

P4610

[Total No. of Pages : 3

[4860] - 1297

M.E. (Production) (Manufacturing and Automation)

MATHEMATICS AND STATISTICS

(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Answer any 5 Questions out of 8 Questions.***
2) ***Neat diagrams should be drawn whenever necessary.***
3) ***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) Define an analytic function, state necessary and sufficient conditions for f(z) = u (x, y) + iv (x, y) to be analytic, also define an harmonic function. **[5]**

b) Evaluate $\oint_C \frac{\cos \pi z^2}{(z-1)(z-2)} dz$ where C is the circle $|z| = 3$ **[5]**

Q2) a) Solve the boundary value problem $y'' - y + x = 0,\ 0 \le x \le 1;\ y(0) = y(1) = 0$ By Rayleigh-Ritz method. **[5]**

b) Find the curves on which the functional

$\int_0^1 (y'^2 + 12xy)\, dx$ with y (0) = 0 and Y (1) = 1 can be extremised **[3]**

c) State the necessary condition for the functional

$\int_{x_1}^{x_2} f(x, y, y', y'')\, dx$ to be extremum. **[2]**

P.T.O.

Q3) a) Explain the standard 5-point formula to solve the Laplace equation

$$\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0.$$ **[5]**

b) Write-down the General second order partial differential equation in two independent variables and then classify it. Also determine whether the following equation is Elliptic or hyperbolic.

$(x+1)u_{xx}-2(x+2)u_{xy}+(x+3)u_{yy}=0$. **[5]**

Q4) a) If $P_n(x)$ is a Legendre polynomial of first kind prove that

$$(n+1)p_{n+1}(x)=(2n+1)xp_n(x)-np_{n-1}(x)$$ **[4]**

b) By using series expression for $J_n(x)$ derive

$$\frac{d}{dx}\left[x^n J_n(x)\right]=x^n J_{n-1}(x).$$ **[4]**

c) State Rodrigue's formula and prove that

$$p_2(x)=\frac{1}{2}(3x^2-1)$$ **[2]**

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 Accident	14	18	12	11	15	14

Test if the accidents are uniformly distributed over the week
Given χ^2 at 5% level for 5 deg. of freedom is 11.09 **[5]**

b) A random sample of size 16 has 53 as mean. The sum of squares of the deviations from the mean is 135. Can this sample be regarded as taken from the population having 56 as mean? Obtain 95% and 99% confidence limits of mean of the population. **[5]**

Q6) a) Consider the transformation.

$w=ze^{i\frac{\pi}{4}}$ and determine the region in the w-plane corresponding to the triangular region bounded by lines x = 0, y = 0, and x + y = 1 in the z-plane. **[4]**

b) Six dice are thrown 729 times. How many times do you expect at least three dice to show a 5 or 6? **[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 :	122	60	15	2	1

b) Prove that the following function **[5]**

$u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ is harmonic.

Also find the conjugate function v and corresponding analytic function u+iv.

Q8) a) In 256 sets of 12 tosses of a coin, in how many cases one can expect 8 heads and 4 tails. **[5]**

b) Test whether the following Markov chain (transition matrix) is ergodic or regular **[5]**

$$\begin{bmatrix} \frac{1}{4} & \frac{1}{4} & \frac{1}{2} \\ \frac{1}{4} & \frac{3}{4} & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \end{bmatrix}$$

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Total No. of Questions : 8]

SEAT No. :

P4332

[Total No. of Pages : 3

[4860]-1298

M.E. (Production) (Manufacturing & Automation)

INDUSTRIAL AUTOMATION

(2013 Credit Pattern) (Semester-I)

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

Instructions to the candidates:

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

Q1) a) A hydraulic system having cycle time of 50 seconds requires 40 lpm at 20 bar pressure for 35 seconds and 25 lpm at 70 bar pressure for the remaining time. Calculate input energy to pump if intensifier is used in the circuit. **[4]**

b) State the applications of counterbalance valve. **[2]**

c) Calculate the tube thickness of a hydraulic cylinder having following data: **[4]**

Tensile strength of cylinder material = 5000 kgf/cm^2

Cylinder bore = 50 mm

System pressure = 150 kgf/cm^2

Factor of safety = 2:1.

Q2) a) A single stage air compressor running at 80 RPM, compress air from a pressure of 1 bar and temperature of 15°C to a pressure of 5 bar. The clearance volume is 5% of swept volume which is 0.42 m^3. Assuming that the compression and expansion to follow the law $PV^{1.3}$ = constant, determine the power required to drive the compressor. **[4]**

P.T.O.

b) Draw the pneumatic circuit showing application of twin pressure valve. Also explain its working. **[4]**

c) Draw symbols for: **[2]**

i) 5/2 spool type direction control valve.

ii) FRL unit.

Q3) a) Draw a ladder diagram that can be used to start a motor and then after a delay of 100 sec. start a pump when the motor is switched off there should be a delay of 10 sec before the pump is switched off. **[4]**

b) Write the program to perform following functions: **[4]**

- Load the number 6AH in register C.
- Load the number 5BH in register D.
- Increment the content of register D by one.
- Add the content of register C and D and display the sum at port 1.

c) A sensor has transfer function of 2.5 mV/°C. Find the required voltage resolution of the signal conditioning if temperature resolution of 0.15°C is required. **[2]**

Q4) a) Write note on: Pressure compensated flow control valve. **[5]**

b) Write note on: Cascade method for pneumatic circuit design. **[5]**

Q5) a) List the various Types of Conveyors. Explain any one with suitable example. **[4]**

b) A feeder selector device at one of the stations of an automatic assembly machine has a feed rate of 25 parts/min and provides a throughput of one part in four. The ideal cycle time of the machine is 10 sec. The feeder stops for 20 parts in feed track and will starts while 10 parts in feed track. Determine how long will it take for the feeder to turn on once it is turned off and how long it will take to turn off once it is turned on? **[4]**

c) State principles of material handling. **[2]**

Q6) a) Explain the Modular Design concept in Robotics. **[4]**

b) One axis of RPL robot is linear slide with total range of 915 mm. The robot control memory is 10 Bit capacity. It assumed that the mechanical errors associated with arm are normally disturbed with mean at a given taught point and an isotropic a Standard deviation of 0.1 mm, determine: **[4]**

i) Control resolution of axis.

ii) Spatial resolution of axis.

iii) The defined accuracy.

iv) Repeatability.

c) Name any four sensors used in medical application robot. **[2]**

Q7) a) Explain need of Simulation in Manufacturing. **[4]**

b) Explain the role of Artificial Intelligence in Forming industry. **[4]**

c) Explain the Recent development manufacturing Simulation. **[2]**

Q8) a) Write short note on: Low Cost Automation. **[5]**

b) Write short note on: Performance analysis of Material Handling System. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4333

[Total No. of Pages : 2

[4860]-1299

M.E. (Production Engineering)

ADVANCED MANUFACTURING PROCESSES

(2013 Credit Pattern) (Semester-I) (511103)

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

Instructions to the candidates:

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

Q1) a) Explain mechanism of melting and solidification of metals in sand casting. **[4]**

b) Write short note on: 'Simulation of mold filling and solidification of metals during casting'. **[4]**

c) List out the features of non-conventional machining processes. **[2]**

Q2) a) Explain with neat sketch working principle of Laser Beam machining. **[4]**

b) Describe important non-destructive testing of weld joints. **[4]**

c) List out important thermal defects in casting with their remedies. **[2]**

Q3) a) Explain with neat sketch working principle of Electro Chemical machining. **[4]**

b) Explain any four mould filling related sand casting defects with their causes and remedies. **[4]**

c) Differentiate between destructive and Non-destructive testing of welds. **[2]**

P.T.O.

Q4) a) Describe principle of material removal, advantages and limitations of Electro Chemical Machining (EDM). **[5]**

b) Explain various welding defects with their causes and remedies. **[5]**

Q5) a) A rod of 10 mm diameter is to be reduced to wire of 4 mm 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 important steps in sheet metal stretch forming with neat sketch. **[4]**

c) Classify the high energy rate forming (HERF) processes. **[2]**

Q6) a) What do you mean by super plasticity? Write note on: Super plastic forming (SPF) process. **[4]**

b) Explain electromagnetic forming with neat sketch. **[4]**

c) Differentiate between hot forging and cold forging. **[2]**

Q7) a) Explain important process parameters of explosive forming process. **[4]**

b) A tube of 25 mm external diameter and 2 mm thickness is to be reduced to 20 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]**

Q8) a) Explain various strategies to reduce roll force. **[5]**

b) Explain forming limit diagram. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4334

[Total No. of Pages : 3

[4860]-1300

M.E. (Production - Manufacturing & Automation)

RESEARCH METHODOLOGY

(2013 Credit Pattern) (511104) (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 indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) What are research ethics? **[4]**

b) Describe the types of research approaches in brief. **[4]**

c) What is historical research? **[2]**

Q2) a) What is factorial design? **[4]**

b) What are the features of good research design? **[4]**

c) Explain the meaning of confounded relationship? **[2]**

Q3) a) Why is the survey technique so popular? When is it not appropriate? **[4]**

b) What is the importance of pilot study and pretest tools? **[4]**

c) What are pantry audits? **[2]**

Q4) Write short notes on the following:

a) Meta-analysis. **[5]**

b) Steps in sample design. **[5]**

Q5) a) The weights of packages received have the mean weight of 300 kg. and a standard deviation of 50 kg. What is the probability that the 25 packages received at random and loaded on elevator will exceed the specified limit of 7800 Kg. The areas under standard normal curve are as shown in Table below: **[4]**

P.T.O.

z	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Area under curve	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452

Assume linear interpolation for values in between.

b) Use multiple linear regression to fit **[4]**

x_1	5	4	3	2	1
x_2	3	–2	–1	4	0
y	15	–8	–1	26	8

Where, x_1 and x_2 are input variables and y is output variable. Also determine the correlation coefficient.

c) Table below shows a survey conducted for a sample of 100 customers to know which color of the car they would prefer: **[2]**

Preferred color	White	Blue	Green	Red
No.of customers	41	19	24	16

Do the data suggest that all colors are equally preferred for significance level 0.05?

[Critical Chi-Square value for DOF3 and $p = 0.05$ is 7.88]

Q6) a) The normalized data of four alternative software for a software selection problem using TOPSIS method are as given below. The criteria considered were: cost (CO), supplier's support (SS), ease of implementation (EI) and technological risk (TR). The weights of these four criteria are 0.30, 0.20, 0.35,and 0.15 respectively. Determine the ranking of the software using TOPSIS method. **[4]**

	CO	SS	EI	TR
Software 1	0.55	0.70	0.39	0.30
Software 2	0.46	0.35	0.55	0.69
Software 3	0.58	0.35	0.63	0.59
Software 4	0.64	0.52	0.39	0.30

b) Determine the initial temperature for a simulated annealing method to solve following optimization problem. **[4]**

Maximize $f(x) = 2x_1 - x_1.x_2 + 10;\ -3 \le x_1 \le 3;\ -2 \le x_2 \le 4,$

c) Calculate permanent of the following matrix **[2]**

$$\begin{bmatrix} 0.6 & 2 & 0.333 \\ 0.5 & 0.3 & 5 \\ 3 & 0.2 & 0.55 \end{bmatrix}$$

Q7) a) Discuss the individual research proposal and institutional research proposal. **[4]**

b) What are various funding agencies to whom the research proposal can be submitted? What are criteria required to be fulfilled while submitting research proposal to these agencies? **[4]**

c) Write various aspects to be considered for oral presentation. **[2]**

Q8) Write short notes on:

a) Artificial neural network. **[5]**

b) Analysis of variance. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4335

[Total No. of Pages : 2

[4860]-1301

M.E. (production - Manufacturing & Automation)

COMPUTER INTEGRATED MANUFACTURING

(2013 Credit 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 calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) Explain how a surface can be described mathematically in a 3D space by parametric equations. **[4]**

b) Given $B_0(3,3)$, $B_1(4,9)$, $B_2(5,6)$, $B_3(2,4)$ the vertices of a Bezier polygon, determine points on the curve with parameter value 't' = 0.65. **[4]**

c) Draw figure showing B-rep hierarchy. **[2]**

Q2) a) What do you mean by a subroutine? How it is useful in CNC program. **[4]**

b) Write a CNC program to turn and face the part shown in Figure 1. **[4]**

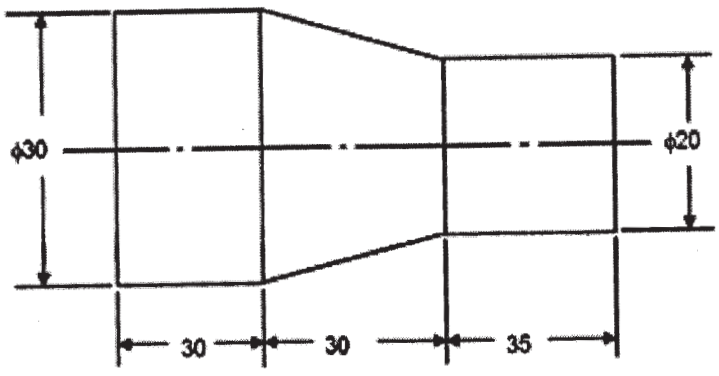


Fig. 1

c) What is absolute zero shift? **[2]**

P.T.O.

Q3) a) The left surface of a plane wall having total thickness of 0.1 m is maintained at 60^{o} C temperature and the right surface is exposed to ambient temperature of 10^{o}C with the heat transfer coefficient 25 W/($m^2.^{o}$C). **[4]**

Determine the assembled stiffness matrix.

b) Calculate the nodal temperatures due to hear transfer in the plate considering uniform mesh of two linear finite elements. Assume thermal conductivity (k) = 0.01 W/(m^{o}C). Assume areas for both elements as $1m^2$. **[4]**

c) What is Eigen value problem? Give any one example. **[2]**

Q4) a) Write short note on "Automatically Programmed Tool". **[5]**

b) Write short note on : "Bezier surface". **[5]**

Q5) a) What is a query language? What are the major types of query language? **[4]**

b) What are the features of PDM which help speedy product development? **[4]**

c) What are the objectives of a database? **[2]**

Q6) a) What are the problems with traditional Production Planning and Control? **[4]**

b) What the components of a small local area network? **[4]**

c) What is "lumpy demand" in case of MRP. **[2]**

Q7) a) Describe in brief the MICLASS classification system used in application of GT. **[4]**

b) With the help of neat diagram, show the typical FMS Controller. **[4]**

c) What are the types of Shop Floor Control (SFC) data to be collected in a modern manufacturing unit. **[2]**

Q8) Write notes on

a) The computer in QC. **[5]**

b) Siemens model of CIM. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4336

[Total No. of Pages : 2

[4860]-1302

M.E. (Production) (Manufacturing & Automation)

TOOL AND DIE DESIGN

(2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

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

Q1) a) In an orthogonal cutting operation, Uncut chip thickness = 0.127 mm, width of cut = 6.35mm, cutting speed = 2 m/s, rake angle = 10^o, cutting force = 567 N, thrust force = 227 N, chip thickness = 0.228 mm. Determine **[4]**

i) Shear angle

ii) friction angle

iii) Shear stress

iv) Chip velocity

v) Shear strain

b) Explain the effect of tool geometry on tool life. **[4]**

c) How much percent of heat is generated at shear zone, at chip tool interface, and at tool work interface? **[2]**

Q2) a) Explain principle of tool proof location. **[2]**

b) Explain analysis to determine the width of diamond pin. **[4]**

c) Determine the clamping force and screw tightening moment for a workpiece in which a hole is to be drilled. In drilling the cutting moment is 30 kN-mm.The workpiece is located on the V-block with angle of V 900. The coefficient of friction between the work and clamp is 0.18. Assume factor of safety 2.25, permissible tensile stress for screw material 80 MPa, thread angle 10^o and angle of friction 15^0. **[4]**

P.T.O.

Q3) a) Find the thickness of die for piercing 20 × 40 mm slot in aluminum blank having 3 mm thickness if permissible shear stress for work material is 250 MPa, and permissible tensile strength for die material is 160 MPa. **[4]**

b) Explain design procedure to produce a washer using compound die with neat sketch. **[4]**

c) What is spring back effect in bending operation? How it is eliminated. **[2]**

Q4) a) Write notes on "Applications of equalizing clamps". **[5]**

b) Explain various methods for holding punches. **[5]**

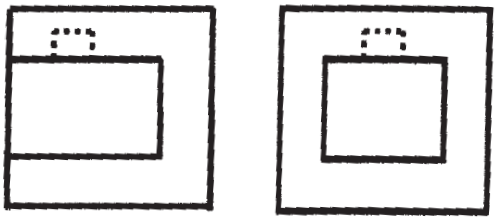
Q5) a) Explain significance of flash in forging. How flash dimensions are determined? **[4]**

b) With neat sketch, explain steps to design of finishing impression in forging dies. **[4]**

c) Write any four forging defects. **[2]**

Q6) a) Derive expression for determining the length of finger cam in injection molding. **[4]**

b) Draw the configuration of an injection mould for producing PVC box having internal undercut as shown in figure. **[4]**



c) Draw the neat sketch of basic underfeed type of mold. **[2]**

Q7) a) Explain the steps in design of ejection system in die casting die design. **[4]**

b) Explain with neat sketch types of cores in die casting dies. **[4]**

c) Which materials are suitable for die casting? **[2]**

Q8) a) Write note on: Design of blocking impression in forging die design. **[5]**

b) Write note on : Design of cooling system in injection mould. **[5]**

Total No. of Questions : 08]

SEAT No. :

P4611

[Total No. of Pages : 2

[4860] - 1303

M.E. (Production) Manufacturing and Automation

ADVANCED JOINING PROCESSES

(2013 Credit Pattern)

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

Instructions to the candidates:

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

Q1) a) Discuss in brief the principle forms of arc welding processes that are differing in the manner of weld shielding against exposure to atmospheric air. **[4]**

b) Describe the general procedure for selecting a welding process for a specific application. **[4]**

c) Write the equations used in the strength analysis of welds. **[2]**

Q2) a) Explain with a neat sketch the working principle of Plasma Arc Welding (PAW) process. **[4]**

b) State the important features of Ultrasonic Welding process. **[4]**

c) Enumerate specific applications of Laser Beam Welding. **[2]**

Q3) a) Which are the different factors that causes the Arc Blow during welding? **[4]**

b) Why standard specimens are used for testing of welds? State the basic considerations in choosing a test for testing the mechanical properties of weldment. **[4]**

c) Explain with neat sketches the faulty weld profiles on a butt and fillet welds. **[2]**

P.T.O.

Q4) a) Discuss the need and role of fixtures in holding the workpieces during the welding operations. **[5]**

b) Explain in brief the popular technique used in welding of pipeline. **[5]**

Q5) a) Calculate the melting efficiency in the case of arc welding of steel with a current of 200 A at 20 V. The travel speed is 5 mm/s, and the cross-sectional area of the joint is 20 mm^2. Heat required to melt steel may be taken as 10 J/mm^3 and heat transfer efficiency is 0.85. **[4]**

b) Explain briefly the stress relieving methods used for welds. **[4]**

c) Give the specific reason why spray metal transfer is more superior to globular metal transfer. **[2]**

Q6) a) Explain the common thermal treatment methods that are carried out on welds. **[4]**

b) Discuss in brief the time, temperature, and isothermal transformations during welding of steel. **[4]**

c) What do you understand by heat affected zone (HAZ) in welding? **[2]**

Q7) a) Briefly explain the hot air welding technique used for welding of PVC plastics. **[4]**

b) Describe the friction welding process with a specific application. **[4]**

c) Draw a neat sketch of a test specimen with a butt joint in-order to find out the strength of plastic sheets. **[2]**

Q8) a) List down the methods used to control the contamination of welds and explain any one method in detail. **[5]**

b) Explain clearly why cast irons are more difficult to weld than steels. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4645

[Total No. of Pages : 2

[4860]-1304

M.E. (Manufacturing and Automation)

ADVANCED ROBOTICS

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Draw neat sketches wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Define robotics and state the laws of robotics. **[4]**

b) How are robots useful in inspection? Explain. **[4]**

c) Sketch jointed arm configuration showing its workspace. **[2]**

Q2) a) How is the rotation of a coordinate frame UVW related to reference frame XYZ? Derive rotation matrix. **[4]**

b) Discuss D-H algorithm for the assignment of link coordinate system. **[4]**

c) Explain how a position vector P is expressed in homogeneous coordinates. **[2]**

Q3) a) Explain with neat sketch a vacuum gripper. **[4]**

b) Describe the architecture of hybrid position/ force control. **[4]**

c) What are the major differences between the open loop and the closed loop servo system? **[2]**

Q4) a) Obtain a composite rotation matrix for a rotation through angle α bout OX axis and then through angle θ about OZ axis. **[5]**

b) Write a note on adaptive control. **[5]**

P.T.O.

Q5) a) Explain VAL. **[4]**

b) Write a note on AML. **[4]**

c) What is task level programming? **[2]**

Q6) a) What is work force torque sensor (WFTS)? Explain with a sketch. **[4]**

b) Explain region growing for segmentation. **[4]**

c) What is image density function? **[2]**

Q7) a) Explain D -H parameters d, θ, a, α. **[4]**

b) Write a note on prismatic joint Jacobian. **[4]**

c) What is Jacobian of a manipulator? **[2]**

Q8) a) Explain absolute and incremental optical encoders with neat sketches. **[5]**

b) How is segmentation done using edge detection? **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4337

[Total No. of Pages : 2

[4860]-1305
M.E. (Production Engineering)
SURFACE ENGINEERING
(2013 Credit Pattern) (611102) (Semester - III)

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

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary.***
5) ***Use of electronic pocket calculator and logarithmic tables is allowed.***

Q1) a) Define any four surface dependent engineering properties of metals. **[4]**

b) What is surface Engineering? How is surface of material degrade or detoriate? **[4]**

c) Write short note on tailoring surfaces of materials. **[2]**

Q2) a) List out various factors to be considered while selecting the cleaning method of industrial parts. **[4]**

b) Explain any two mechanical surface cleaning techniques used for industrial parts. **[4]**

c) Differentiate between solvent and acid cleaning. **[2]**

Q3) a) Write short notes on: **[8]**

i) Electroplating

ii) Galvanising

b) Differentiate between metal and non-metal coatings of industrial parts. **[2]**

Q4) a) Describe surface modification of materials by ion implantation. **[5]**

b) What you mean by fatigue life of industrial part? List out the factors which affect the fatigue life. **[5]**

P.T.O.

Q5) a) Explain Physical Vapor Deposition (PVD) process with its applications. **[4]**

b) Explain Chemical Vapor Deposition (CVD) process with its applications. **[4]**

c) Describe the importance of diamond coating. **[2]**

Q6) a) Write short note on non-destructive methods of measuring coating thickness:

i) Eddy Current Method. **[4]**

ii) Magnetic Induction Method. **[4]**

b) Suggest suitable coating hardness testing method for following: **[2]**

i) Steel, Cu, Al, Zn & Mg

ii) Hard rubber & Plastics.

Q7) a) State the basic difference between oxidation/corrosion resistant coating and thermal barrier coating. **[5]**

b) Explain desirable requirements for high temperature metallic coatings. **[5]**

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 : 7]

SEAT No. :

P4338

[Total No. of Pages : 2

[4860]-1306
M.E. (Computer Engineering)
APPLIED ALGORITHMS
(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Q.No. 1 is compulsory. Solve any 5 from Q.No. 2 to Q.No.7.***
2) ***Figures to the right indicate full marks.***
3) ***Neat daigrams must be drawn wherever necessary.***
4) ***Assume Suitable data if necessary.***

Q1) a) State whether following equalities are correct or incorrect and prove it.

i) $4n^4 - 6n = \Theta(n^2)$

ii) $1000n^3 + 6 = O(n^2)$ **[5]**

b) Explain in detail Empirical measurement of performance of algorithms. **[5]**

Q2) a) Write Prim's minimum spanning tree algorithm and determine its time complexity. **[4]**

b) Give and explain single source shortest path algorithm and all pair shortest paths in Graph. **[4]**

Q3) a) Explain with suitable examples Epsilon approximations. **[4]**

b) Explain in details probabilistically good algorithms. **[4]**

Q4) a) Give divide and conquer algorithm for solving closest pair of points problem. **[4]**

b) Give and explain Jarvis March Algorithm. **[4]**

P.T.O.

Q5) a) Solve the given problem by simplex method. **[4]**

Max $Z = 107X_1 + X_2 + 2\ X_3$

STC

$14X_1 + X_2 - 6X_3 + 3X_4 = 7$

$16X_1 + 1/2X_2 - 6X_3 <= 5$

$16X_1 - 8X_2 - X_3 <= 0$

$X_1, X_2, X_3, X_4 >= 0$

b) Explain problem formulation for single source shortest path. Also Write algorithm. **[4]**

Q6) a) Obtain the dual problem of the following LPP **[4]**

Max $Z = 2X_1 + 5X_2 + 6X_3$

STC

$5X_1 + 6X_2 - 4X_3 <= 3$

$-2X_1 + X_2 + 4X_3 <= 4$

$X_1 - 5\ X_2 + 3X_3 <= 1$

$-3X_1 - 3X_2 + 7X_3 <= 6$

$X_1\ ,\ X_2\ ,\ X_3 >= 0$

b) Explain problem formulation for vertex cover problem. Also Write algorithm. **[4]**

Q7) a) Give and explain inequalities and limit theorems. **[4]**

b) Explain random variable with suitable example. **[4]**

Total No. of Questions : 6]

SEAT No. :

P4339

[Total No. of Pages : 2

[4860]-1307

M.E. (Computer Engineering)

HIGH PERFORMANCE DATABASES

(2013 Credit Pattern) (Semester - I) (510102)

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

Instructions to the candidates:

1) ***All six questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume Suitable data if necessary.***

Q1) a) Define database Workload. Explain automated tuning of database design. **[4]**

b) If you were about to create an index on a relation, what considerations would guide your choice? Discuss. **[5]**

i) The choice of primary index.

ii) Clustered versus un-clustered indexes.

iii) Hash versus tree indexes.

iv) The use of a sorted file rather than a tree-based index.

v) Choice of search key for the index.

Q2) a) Explain Two Phase commit protocol to handlefollowing failures in Distributed Environment. **[4]**

i) Site Failure.

ii) Coordinator Failure.

iii) Network Partition.

b) Explain various transformations of global queries into fragment queries in distributed databases. **[4]**

Q3) Solve Any Two:

a) Explain Transaction Management in Multi-databases with suitable example. **[4]**

b) Consider a main-memory database system recovering from a system crash. Explain the relative merits of : **[4]**

P.T.O.

i) Loading the entire database back into main memory before resuming transaction processing.

ii) Loading data as it is requested by transactions.

c) Write a short note on TP monitors. **[4]**

Q4) a) Give a relational schema to represent bibliographical information specified according to the DTD fragment given below. the relational schema must keep track of the order of author elements. Assume that only books and articles appear as top-level elements in XML documents. **[4]**

```
<!DOCTYPE bibliography [
<!ELEMENT book (title, author +, year, publisher,place ?)>
<!ELEMENT author (last_name, first_name)>
<!ELEMENT title (# PCDATA)>
.....similar PCDATA declarations for
year, publisher, place, journal, year, number, volume,
        pages, last_name and first_name
        ]>
```

Create XML document and XML schemas for above DTD.

b) Write a short note on (Any One) **[4]**

i) SAX Parser

ii) XQuery

Q5) a) Consider a database of documents in which all documents are kept in a central database, Copies of some documents are kept on mobile computers. Suppose that mobile computer A updates a copy of document 1 while it is disconnected, and, at the same time, mobile computer B updates a copy of document 2 while it is disconnected. Show how the version-vector scheme can ensure proper updating of the central database and mobile computers when a mobile computer reconnects. **[4]**

b) Explain Multimedia databases for Video Streaming Applications. **[4]**

Q6) a) Explain HDFS in Hadoop framework. **[5]**

b) Explain database schema and transaction tuning with suitable example. **[4]**

Total No. of Questions : 6]

SEAT No. :

P4340

[Total No. of Pages : 2

[4860]-1308
M.E. (Computer)
ADVANCED COMPUTER ARCHITECTURE
(510103) (2013 Credit 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 right side indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Draw the dependence graph and analyze the various dependencies among the following statements in a given program- **[5]**

S1: A = B + D

S2: C = A X 3

S3: A = A + C

S4: E = A/2

b) Distinguish between vector and array processors. State the operational model of SIMD Computer clearly specifying its tuples. **[4]**

OR

a) Discuss the features and performance of Interconnection Networks used in multiprocessor systems. **[5]**

b) State the concept of fine grain and coarse grain scheduling. How the grain size affects on the parallelism observed in multiprocessor systems? **[4]**

Q2) a) Compare the SIMD architecture with MIMD. Comment on the performance of both w.r.t. parallel processing. **[4]**

b) Derive the Amdahl's law for speedup performance. Comment on the major observations and conclusions drawn w.r.t. the speedup obtained.**[4]**

OR

a) Define the term Degree of Parallelism (DOP). Describe Average Parallelism in terms of DOP. **[4]**

b) What is principle of Scalability? How the terms Speedup and Efficiency w.r.t. scalability reflect the performance of parallel computer systems?**[4]**

P.T.O.

Q3) a) Explain Two virtual memory models used with multiprocessor systems. **[4]**

b) Discuss the important features of Superscalar processor architectures. What do you mean by k-issue processor? **[4]**

OR

a) State the 4-level memory hierarchy defined for a computer system. How the data transfer takes place between adjacent levels of a memory hierarchy? **[4]**

b) Explain in brief, the use of Reservation stations and Hardware scoreboarding for dynamic instruction scheduling in pipeline processors. **[4]**

Q4) a) What are multi-threaded architectures? Discuss the various performance parameters of multi-threaded processor architectures. **[4]**

b) Explain the hierarchical cache/bus architecture used for designing a scalable multiprocessor system. **[4]**

OR

a) Discuss and compare between store-and -forward routing and wormhole message routing schemes. **[4]**

b) Explain in brief the concept of vector chaining and vector looping implemented in Cray architecture. **[4]**

Q5) a) With example explain shared memory parallel programming model. What is the use of synchronization primitives? **[4]**

b) Explain the features of C-Linda. State and define different Linda primitives. **[4]**

OR

a) State and explain different collective communication functions designed for MPI. **[4]**

b) Discuss with example any Three optimizing/Vectorizing functions designed for optimizing compilers. **[4]**

Q6) a) Compare between grid and cloud computing. What is cloud middleware? **[5]**

b) Discuss important features of Neural Networks. How Neural Networks architectures can be used for distributed parallel computing? **[4]**

OR

a) With block diagram, explain the architecture of grid computing model. **[5]**

b) Explain different services offered by Cloud. What is the difference between public and private cloud? **[4]**

Total No. of Questions : 6]

SEAT No. :

P4341

[Total No. of Pages : 2

[4860]-1309
M.E. (Computer Engineering)
RESEARCH METHODOLOGY
(2013 Credit Pattern) (Semester - I) (510104)

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

Instructions to the candidates:

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

Q1) a) What is research? Explain the objectives of research and describe the steps which are included in the research process. **[9]**

OR

b) Describe the different types of research, clearly pointing out the difference between an experiment and a survey. **[9]**

Q2) a) What is the necessity of defining a research problem? Explain different techniques involved in defining a research problem? **[8]**

OR

b) Should every research problem have hypothesis? Discuss the steps involved in formulation and testing the hypothesis. **[8]**

Q3) a) Explain the following experimental designs: **[8]**

i) Completely Randomized Design [C.R. Design].

ii) Randomized block Design [R.B.Design].

OR

b) Discuss the relative merits and demerits of rating versus Ratio Scale and Cumulative Versus Summated Scale. **[8]**

P.T.O.

Q4) a) It has been found that 80% of all the tourists who visit India visit Delhi, 70% of them visit Mumbai and 60% of them visit both. What is the probability that a tourist will visit at least one city? Also find the probability that he will visit heither city. **[8]**

OR

b) Explain the use of analysis of variance (ANOVA) and covariance (ANACOVA). Breifly explain multivariate ANOVA. **[8]**

Q5) a) How will you differentiate between descriptive statistics and inferential statistics? Describe the important statistical measures often used to summarize the survey/research data. **[8]**

OR

b) Explain type I and type II error in the context of hypothesis testing. Comment on the need for a researcher to strike a balance between type I and type II errors. **[8]**

Q6) a) What is Little's law and explain its use in queuing theory with suitable examples. **[9]**

OR

b) What is the significance of a research report? Explain different types of research reports. **[9]**

Total No. of Questions : 12]

SEAT No. :

P4342

[Total No. of Pages :3

[4860]-1310
M.E. (Computer Engineering)
OPERATING SYSTEM DESIGN
(2013 Credit 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) 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? **[5]**

b) Explain the different mechanism of Interprocess Communication? **[4]**

OR

Q2) a) What are the design problems and design techniques. **[5]**

b) Explain the different kind of CPU registers. **[4]**

Q3) a) How flow of control moves in the Operating systems. **[4]**

b) Justify Operating Systems as Event and Table Managers. **[2]**

c) What is context switching? **[2]**

OR

Q4) a) Explain the behavior of round robin scheduling in heavily loaded system. **[4]**

b) How signaling in the Operating System works. **[4]**

P.T.O.

Q5) a) Suppose we decided to keep track of which process creates a message queue and to destroy message queue automatically when the process that created it exits. What problem would this solve and what problem would this cause? (Use of Mathematical model is expected). **[4]**

b) Demonstrate use of design technique " Win big then give some back" for multiprogramming in the context of operating system. **[4]**

OR

Q6) a) Explain with example following interprocess communication problems Starvation , deadlock, data inconsistency , shared buffer. **[4]**

b) Suppose we want to change the message size used in the simple operating system from 8 word to 1024 words. What changes in the code would be required? Give some good and bad effects. **[4]**

Q7) a) Explain the storage violation and memory protection. **[4]**

b) What are design techniques in the memory managements. **[4]**

OR

Q8) a) How processes are link and loaded and explain the variation in loading the process. **[4]**

b) Explain the memory management design problem. What are the solutions available to memory management design problem? **[4]**

Q9) a) What is importance of proc file system. **[4]**

b) Explain block devices and character devices driver. How to insert a driver in the operating system. **[4]**

OR

Q10) a) Explain the data structures required to implement file system. **[4]**

b) What is blocking and non blocking IO devices. **[4]**

Q11)a) What is Queuing Models of Scheduling. **[5]**

b) What are the mechanism for software protection. **[4]**

OR

Q12)a) What is the soft and hard real time operating system and explain the scheduling in real time system. **[5]**

b) Show how to use cryptography to solve the following problem using appropriate design methodology: **[4]**

Create a message that can be read if any two of three people cooperate, but can not be read by any one of them acting alone. Use only the public keys of three people.

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Total No. of Questions : 6]

SEAT No. :

P4343

[Total No. of Pages :2

[4860]-1311

M.E. (Computer Engineering)

SOFTWARE DESIGN AND ARCHITECTURE

(2013 Credit Pattern)(Semester - II)

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

Instructions to the candidates:

1) ***Solve question number 1 or 2, 3 or 4 and 5 or 6.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Write in short the applicability, structure and implementation of:- **[8]**

i) Abstract factory.

ii) Flyweight pattern.

b) Describe the use of design patterns to solve design problems. **[8]**

OR

Q2) a) What are design patterns? How they are documented using a template? Explain the way they are documented with examples to illustrate from Facade pattern. **[8]**

b) What is design notation? Explain with example. **[8]**

Q3) a) Explain the styles of module view - type and execution Architecture View type. **[8]**

b) What is software architecture? Why it is important? What are the different Quality Attribute scenarios? **[8]**

OR

Q4) a) Explain styles of Component- and - connector view- type. **[8]**

b) What are the concept of systematic reuse and its particular implementation using product lines? **[8]**

P.T.O.

Q5) a) What are the concepts of Data -Centered Software Architecture. Evaluate the benefits and limitations of data- centered software architecture and examine data- centered architecture when incorporated with other architectures. **[9]**

b) Write short notes on :- **[9]**

i) Model Driven Architecture (MDA).

ii) Customer Relationship Management (CRM).

OR

Q6) a) Explain the concepts of any three archetype patterns. **[9]**

b) Describe a complete object - oriented analysis and design process and discuss general design principles in the context of object - oriented design. **[9]**

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Total No. of Questions : 6]

SEAT No. :

P4344

[Total No. of Pages :2

[4860]-1312

M.E. (Computer Engineering)

ADVANCED COMPUTER NETWORKS

(510109) (2013 Credit Pattern) (Semester -II)

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

Instructions to the candidates:

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

Q1) a) Explain Online Examination System of our University. Explain various issues of Network Design to conduct the examination. **[9]**

OR

b) Draw and explain various advanced network architectures.. **[9]**

Q2) a) Explain all queuing models using Little's and probabilistic form of Little's theorem. **[8]**

OR

b) Compare various queuing systems with respect to performance. **[8]**

Q3) a) Explain how Sharma's algorithm optimizes CMST. **[8]**

OR

b) Explain open, semi - open and closed queue network with example. **[8]**

Q4) a) Explain the resource reservations process in traffic engineering. **[9]**

OR

b) What are different requirements of smart devices used for Ubiquitous computing? Explain with example. **[9]**

P.T.O.

Q5) a) Compare IPv4 and IPv5 packet format. **[8]**

OR

b) Differentiate IPv4 and IPv6 routing methodologies. **[8]**

Q6) Write short note on (any TWO) **[8]**

a) Content Distribution Networks.

b) Cyber physical systems.

c) Computer network simulation.

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Total No. of Questions : 6]

SEAT No. :

P4345

[Total No. of Pages :2

[4860]-1313

M.E. (Computer Engineering)

ADVANCED STORAGE SYSTEMS AND INFRASTRUCTURE MANAGEMENT

(610101) (2013 Credit Pattern) (Semester -III)

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

Instructions to the candidates:

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

Q1) a) The average I/O size of an application is 128 KB . The following specifications are available from the disk manufacture: average seeks time = 3ms, 8,400 RPM, transfer rate = 40 MB/s. Determine the maximum IOPS that could be performed with this disk for this application. **[5]**

b) Explain the terms Idle flushing , High Watermark flushing and Forced flushing in relevance to cache watermarking. **[5]**

Q2) a) What are the factors that affect the performance and availability of NAS? Explain. **[5]**

b) What is SCSI ? Describe the SCSI-3 Architecture and explain the steps involved in SCSI Communication. **[5]**

Q3) a) What is single point of failure? Give examples in context of data center environment. **[5]**

b) What is the importance of recoverability and consistency in Remote replication? **[5]**

Q4) a) What are the various elements of IT Infra structure? How are they related? **[5]**

b) What are the various Infrastructure management activities? **[5]**

P.T.O.

Q5) a) Explain with neat diagram Information Technology Infrastructure Library. **[5]**

b) Which common tasks should be performed for IT System Management? **[5]**

Q6) a) What is Service Delivery? What management practices ensure that IT services are provided as per the agreement between service provider and customer? **[5]**

b) Explain the following terms: **[5]**

i) Service level Management.

ii) Financial Management and Costing.

iii) Availability Management.

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Total No. of Questions : 8]

SEAT No. :

P4346

[Total No. of Pages :2

[4860]-1314

M.E. (Computer Engineering)

ADVANCED UNIX PROGRAMMING

(610102) (2013 Credit Pattern) (Semester -III)

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

Instructions to the candidates:

1) ***Attempt ANY FIVE Questions out of 8 Questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) What is the purpose of grep command? Explain the various options available with the grep command with an example. **[4]**

b) Write short notes on the following: **[4]**

i) Process utilities.

ii) Disk utilities.

c) Explain the two methods of altering file access permissions of a file. **[2]**

Q2) a) Explain the various features of IA-64 architectures in brief. **[5]**

b) Explain the following system calls with syntax : **[3]**

i) Setjmp ( ).

ii) Longjmp ( ).

iii) Exit ( ).

c) Write a note on Reliable signal Handling". **[2]**

Q3) a) Explain about the various possible signal default actions. **[3]**

b) Write a note on Memory Mapped I/ O. **[5]**

c) Explain the differences between _ exit () & atexit () system calls? **[2]**

P.T.O.

Q4) a) What do you mean by ' slow system call' ? What action is expected to overcome the effect of system call? **[4]**

b) What is record lock? What are the rules about the specification of the region to be locked or unlocked? **[4]**

c) Explain Copy on Write (COW) concept in UNIX. **[2]**

Q5) a) What are the named pipes? Explain in detail. **[4]**

b) Explain in detail SHM _ LOCK and SHM _ UNLOCK in Shared memory IPC. **[4]**

c) Explain the importance of unlink ( ) in case of FIFO. **[2]**

Q6) a) Compare and contrast the various IPC mechanisms: FIFO, Message Queue and semaphores. **[6]**

b) What is the role of shared memory in group communication? Explain with a suitable example. **[4]**

Q7) a) What are different models of concurrent server design? Explain any one model in detail. **[6]**

b) Write a note on RPC. **[4]**

Q8) a) Write short notes on the following. **[6]**

i) Socket address structure for IPv4.

ii) Socket descriptor.

b) Explain in detail TCP and UDP sockets. **[4]**

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Total No. of Questions :[12]

SEAT No. :

P4347

[Total No. of Pages :2

[4860]-1315

M.E.(Computer Engineering)(Computer Networks)

ADVANCED NETWORKS ALGORITHMS

(510201) (2013 Credit Pattern) (Semester-I)

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

Instructions to the candidates:

1) ***Attempt questions Q1 or Q2,Q3 or Q4,Q5 or Q6,Q7 or Q8,and Q9 or Q10,and Q11 or Q12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Network bottleneck are fundamental reasons for network performance degradation: justify. **[4]**

b) Explain different end - node bottlenecks. **[4]**

OR

Q2) a) Summarize 15 implementation principles in brief. **[4]**

b) Explain how router architecture affects network performance? Explain. **[4]**

Q3) a) Explain common protocol functions. **[4]**

b) Explain packet filtering in routers. **[4]**

OR

Q4) a) Distinguish between design and implementation principles? **[4]**

b) Explain the problem of policing traffic patterns **[4]**

Q5) a) Why do systems need timers? **[5]**

b) Write a short note on "Obtaining fine granularity timers". **[4]**

OR

P.T.O.

Q6) a) How timers are used by systems for failure recovery? Give examples. **[5]**

b) Explain in details four component routines of a timer module. **[4]**

SECTION-II

Q7) a) Explain how the challenge of maintaining effective ethernet throughput is handled. **[4]**

b) Write a short note on "filtering repeater" **[4]**

OR

Q8) a) Explain in details lookup chip model. **[4]**

b) Explain tree bit map search scheme. **[4]**

Q9) a) Explain the problem of packet classification. **[4]**

b) Explain with a neat diagram rules that provide traffic sensitive routing. **[4]**

OR

Q10)a) Explain how linear search and catches are used for efficient classification. **[4]**

b) With respect to packet classification explain decision tree approach. **[4]**

Q11)a) Distributed systems are subject to lack of synchrony, a lack of assurance, and a lack of trust:true or false?-justify your answer **[5]**

b) Explain the problem of flow control with respect to improving performance. **[4]**

OR

Q12)a) Why network traffic measurement is difficult task? **[5]**

b) Explain in brief, approaches to traffic matrices computation. **[4]**

Total No. of Questions : 8]

SEAT No. :

P4348

[Total No. of Pages :2

[4860]-1316

M.E.(Computer) (Computer Networks)

WIRELESS COMMUNICATION

(2013Credit Pattern) (510202)(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) What is OFDM? Explain OFDM systems. Pros and Cons also discuss about OFDMA subchannelization. **[6]**

b) Explain advanced antenna systems for performance enhancements in WiMax network, also discuss about enhanced frequency reuse mechanism. **[6]**

OR

Q2) a) What is multipath propagation? Write down the formulas for following path loss models: Free space model, Two ray model and empirical path loss model. How the empirical path loss formula will be modified in shadowing? **[6]**

b) Briefly review and differentiate between narrowband and broadband fading. **[6]**

Q3) a) Explain MPLS network and components with suitable diagram. **[6]**

b) Explain different components of mobile IP with figure,Briefly explain triangular routing. **[6]**

OR

Q4) a) Explain closed-loop MIMO framework in IEEE 802.16e-2005 with figure. **[6]**

b) What is the role of convergence sub layer in WiMax protocol stack? Explain various steps involved in a typical PHS operation in WiMAX.**[6]**

P.T.O.

Q5) a) Explain in brief some of the important design principles that guided the development of the WiMAX network systems architecture. **[6]**

b) What is the need of QoS? Explain QoS functional architecture as proposed by the WiMAX NWG. **[7]**

OR

Q6) a) Explain CSN-Anchored mobility for IPv4. **[7]**

b) What is the need of paging and Idle - Mode operation?Explain WiMAX paging reference model. **[6]**

Q7) a) Explain methodology for link level simulation. **[7]**

b) What are the benefits of multiple antenna techniques in WiMax? **[6]**

OR

Q8) Write short notes on (Any two). **[13]**

a) Type I and Type II hybrid-ARQ.

b) Convergent devices.

c) Internetworking between WLANS and 3G

Total No. of Questions : 6]

SEAT No. :

P4349

[Total No. of Pages : 2

[4860]-1317
M.E.(Computer Networks)
ADVANCED DATABASES
(2013CreditPattern) (510203) (Semester-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) ***Assume suitable data if necessary.***

Q1) a) Explain the difference between hash indexes and B+ trees indexes. In particular discuss how equality & range searches work using an example. **[4]**

b) Suppose a system runs three types of transactions.Transactions of type A run at the rate of 50 per second, transactions of type B run at 100 per second and transactions of type C run at 200 per second. Suppose the mix of transactions has 25 percent of typeA, 25 percent of type B,and 50 percent of type C. **[4]**

i) What is the average transaction throughput of the system, assuming there is no interference between the transactions?

ii) What factors may result in interference between the transactions of different types, leading to the calculated throughput being incorrect?

Q2) a) Define recovery process in distributed database? What are different ways of failure modes? **[4]**

b) A relation can be distributed by fragmenting it or replicating it across several lines. Explain these concepts & how they differ. Also distinguish between horizontal and vertical fragmentation. **[4]**

Q3) a) What is the purpose of compensating transaction? Present two examples of their views. **[4]**

b) Explain in detail connection workflow and long duration transaction. **[4]**

P.T.O.

Q4) a) Consider the following recursive DTD: **[6]**

<!DOCTYPE parts[

<!ELEMENT part(name, subpartinfo*)>

<!ELEMENT subpartinfo (part, quantity)>.

<!ELEMENT name (#PCDATA)>

<!ELEMENT quantity (#PCDATA)>] >

Give a small example of data corresponding to this DTD.

Show how to map this DTD to a relational schema.You can assume that part names are unique; that is, wherever a part appears, its subpart structure will be the same.

Create a schema in XML schema corresponding to this DTD.

b) Explain DOM/SAX interface semi structured data base. **[3]**

Q5) a) Name several application that deal with spatial data & specify their requirements on a database system. **[4]**

b) Will functional dependencies be preserved if relation is converted to a temporal relation by adding a time attribute. How is the problem handled in a temporal database. **[4]**

Q6) a) A big company stores all incoming emails in log files. How can you count the frequency of each email address found in these logs with MAPREDUCE? **[5]**

b) Explain the architecture of CouchDB with example? **[4]**

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Total No. of Questions : 12]

SEAT No. :

P4350

[Total No. of Pages :2

[4860]-1318
M.E.(Computer Networks)
RESEARCH METHODOLOGY
(2013Credit Pattern) (Semester-I)(510204)

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

Instructions to the candidates:

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

Q1) Describe different types of research? List down the steps involved in a research process. **[9]**

OR

Q2) "Research is an important tool for the function of management",Discuss in detail. **[9]**

Q3) What is research problem? What are different techniques to define a research problem? **[8]**

OR

Q4) Explain in detail, the hypothesis and hypothesis formulation, with suitable example **[8]**

Q5) Describe steps of research methodology with suitable example? **[8]**

OR

Q6) Differentiate between research methodology and research design. IIlustrate your answer with suitable example. **[8]**

P.T.O.

Q7) Explain the terms: Structured observation, unstructured observation, control observation and uncontrolled observation with suitable examples. **[9]**

OR

Q8) An insurance company receives on an average 02 telephone calls every 10 2 minutes. Find the probability of no call and 03 calls received in 30 minutes.(Given $e^{-5} = 0.007$) **[9]**

Q9) Explain the significance of testing& measurement in research? What does a measure of central tendency indicate? **[8]**

OR

Q10)Describe the precautions that the researchers should take while interpreting his/her findings. **[8]**

Q11)Enlist and explain different types of report, and differentiate the technical report and a popular report. **[8]**

OR

Q12)Describe the significance of a research report and narrate the various steps involved in writing such a report? **[8]**

Total No. of Questions : 8]

SEAT No. :

P4351

[Total No. of Pages : 3

[4860]-1319
M.E.(Computer Networks)
NETWORK DESIGN, MODELLING AND ANALYSIS
(2013 Credit Pattern) (Semester-II)

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

Instructions to the candidates:

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

Q1) a) A production line is equipped with two quality-control check points that tests all items on the line.At check point # 1, 10% of all items failed the test.At check point #2, 12% of all items failed the test. We also know that 3% of all items failed both tests. **[4]**

i) If an item failed at check point #1, what is the probability that it also failed at check point #2?

ii) What is the probability that an item failed at check point #1 or at check point # 2?

iii) What is the probability that an item failed at neither of the check points?

b) At a car park there are 100 vehicles, 60 of which are cars, 30 are vans and the remainder are lorries. If every vehicle is equally likely to leave, find the probability of if either a lorry or van had left first, then there would be 99 vehicles remaining, 60 of which are cars. Let T be the sample space and C be the event of a car leaving. **[4]**

P.T.O.

Q2) a) Explain Little's theorem with suitable example.Enlist different applications of Little's theorem. **[4]**

b) Explain Occupancy Distribution on Arrival for M/M/2 Queue. **[4]**

Q3) Write a shot note on (any two). **[10]**

a) Poisson process.

b) Attribute selection while modelling Network as a Graph.

c) D/D/1 queue.

Q4) a) Solve terminal assignment problem for given data. **[5]**

Weight of node=01, Max. capacity of concentrator=03

	G	H	I	K
a	5	8	2	5
b	5	6	4	2
c	2	9	7	2
d	1	8	2	9
e	6	3	4	0
f	2	2	2	1

b) Explain Bin Packing algorithm with suitable example. **[3]**

Q5) a) Explain One Speed One Center Design. **[4]**

b) Describe why adding new sites in the network is a significant problem in network design. **[4]**

Q6) a) Explain routing design for TCP and UDP connections. **[4]**

b) Explain Multi-Speed Access Design. **[4]**

Q7) a) Explain with suitable example how degree of node effects fault tolerence. **[4]**

b) Explain different techniques for merging two networks. **[4]**

Q8) Write a short note on (any two). **[10]**

i) MENTOR Algorithm

ii) Difference between Routing and Switching.

iii) Performance Metrics for Network.

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Total No. of Questions : 8]

SEAT No. :

P4352

[Total No. of Pages : 2

[4860]-1320
M.E. (Computer Networks)
DISTRIBUTED SYSTEMS
(2013 Credit Pattern) (Semester-II) (510208)

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

Instructions to the candidates:

1) ***Attempt any three questions from Question No. 1,2,3,4***
2) ***Attempt any three questions from Question No. 5,6,7,8***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain What is meant by transparency in distributed system and give examples of different transparencies. **[5]**

b) List out various communication features in handling remote objects. **[4]**

Q2) a) Discuss various commonly used models for building distributed systems. **[4]**

b) Explain Ricart and Agarwala's algorithm with its advantages & disadvantages. **[4]**

Q3) a) Explain Deadlock detection algorithm in detail. **[4]**

b) What is Lamport's Clock synchronization algorithm? Discuss the limitations of Lamport's clock. **[4]**

Q4) a) Write a short note on Distributed Transactions. **[3]**

b) Discuss following issues with respect to RPC. You may use specific RPC Mechanism as a base. **[5]**

i) Structure and Transparency achievement in RPC.

ii) Binding methods.

iii) Parameter and result Passing.

iv) Semantics.

v) Error handling.

P.T.O.

Q5) a) What is fault tolerant system. What are different failure types. **[4]**

b) Write receiver initiated algorithm in distributed systems. **[4]**

Q6) a) Discuss backward and forward recovery. **[4]**

b) What are three main approaches for designing DSM system. **[4]**

Q7) a) What is JMS? Discuss in brief with the perspective of distributed systems. **[4]**

b) Explain Distributed file system requirement in detail. **[4]**

Q8) Write short notes on: **[9]**

a) UDDI

b) SOAP

c) WSDL

x x x

Total No. of Questions : 8]

SEAT No. :

P4353

[Total No. of Pages : 2

[4860]-1321

M.E.(Computer) (Computer Networks)

HIGH PERFORMANCE NETWORKS

(2013 Credit Pattern) (510209) (Semester-II)

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

Instructions to the candidates:

1) ***Attempt any three questions from Question No. 1,2,3,4***
2) ***Attempt any three questions from Question No. 5,6,7,8***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***

Q1) a) What is 10-Gigabit Ethernet? Explain Gigabit Ethernet Technology in detail. **[5]**

b) Explain in detail Token Bus Technology and Token Ring Technology. **[4]**

Q2) a) Differentiate between the following, highlighting the Pros and Cons (Any Two) **[4]**

i) Wi-Fi and WiMAX

ii) X.25 and Frame relay

iii) Fast Ethernet and Gigabit Ethernet

b) Compare Message Switched Network and Circuit Switched Network. **[4]**

Q3) a) Draw and explain ATM protocol reference model. **[4]**

b) Explain architecture of Gigabit Ethernet. **[4]**

Q4) a) Draw and Explain ATM Cell Format User-network interface. **[4]**

b) Explain the various functions of ATM Layer. **[4]**

Q5) a) What is MPLS? Draw and Explain the structure of Label. **[4]**

b) Draw and explain IP over MPLS architecture. **[4]**

Q6) a) List and explain salient features of WiMAX. **[4]**

b) Explain the features of Wireless LANs(IEEE 802.11). **[4]**

P.T.O.

Q7) a) Discuss the Salient Features of Broadband wireless networks. **[4]**

b) Explain in detail physical and MAC layer of WiMax. **[4]**

Q8) a) Which are the different scheduling algorithms used for HSDPA to schedule the transmission for users. **[5]**

b) List and explain research areas of MPLS. **[4]**

x x x

Total No. of Questions : 6]

SEAT No. :

P4354

[Total No. of Pages :1

[4860]-1322
M.E. (Computer Networks)
ADVANCED TCP/IP
(2013 Credit Pattern) (610201) (Semester - III)

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

Instruction to the candidates:

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

Q1) a) Draw diagram for TCP/IP protocol suite and explain working of each layer. **[5]**

b) Write short note on SCTP comparing it with TCP. **[5]**

Q2) a) Explain working of RTP for VOIP. **[5]**

b) Explain working of DNS. **[5]**

Q3) a) Explain command and responses in SMTP. **[5]**

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

Q4) a) Explain working TCP Vegas for Congestion detection and avoidance. **[5]**

b) Explain Open loop flow control mechanism. **[5]**

Q5) a) Write note on TCP performance in mixed wired and wireless environment. **[5]**

b) Explain working DSDV Protocol. **[5]**

Q6) a) Write short note on VPN. **[5]**

b) Explain any two types of firewalls. **[5]**

x x x

Total No. of Questions : 12]

SEAT No. :

P4355

[Total No. of Pages : 2

[4860]-1323
M.E. (Computer Networking)
SYSTEM OPERATIONS AND MAINTENANCE
(2013 Credit Pattern) (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. 7 or 8, Q. 9 or 10. , Q. 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) Explain basic functions offered by an operating system process scheduling, interrupt handling, memory management, inter-process communication, and common routines (or library). **[9]**

OR

Q2) What is microkernel? Explain microkernel based operating system. **[9]**

Q3) Explain the components of Configuration Management. **[8]**

OR

Q4) What is two stage configuration model? Explain with suitable example. **[8]**

Q5) What is SNMP? Which different versions of SNMP those are supported by Cisco IOS XR software? Also explain basic steps are needed to configure SNMP on an IOS XR router. **[8]**

OR

Q6) Explain basic steps are needed to configure SNMP on an IOS XR router. Also Compare Admin plane and Secure domain router (SDR) plane used in Cisco IOS XR operating software. **[8]**

Q7) List 4 different types of Interior Gateway Protocol (IGP), Explain any two in details. **[8]**

OR

Q8) Explain in details Enhanced Interior Gateway Routing Protocol. **[8]**

P.T.O.

Q9) Draw and explain Cisco IOS XR MPLS Architecture. Also explain following MPLS Label Operations: Push, Pop, De-aggregate, Swap and push **[8]**

OR

Q10) Explain the overview of IOS XR Multicast routing and its components. **[8]**

Q11) Explain different components of SDR Shared Resources. Give step by step configuration of Secure Domain Router. **[9]**

OR

Q12) Explain the following components of Multishelf. **[9]**

a) Line Card Chassis.

b) Fabric Card Chassis.

c) Switch Card Chassis.

Total No. of Questions : 8]

SEAT No. :

P4356

[Total No. of Pages : 3

[4860] - 1324

M.E. (Chemical)

MATHEMATICAL AND STATISTICAL METHODS

(2013 Credit Pattern) (509101) (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) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Solve the differential equation using power series. **[5]**

$y' - y = 0$

$y'' = 2xy$

b) Write note on criteria for critical point stability. **[3]**

c) State Legendre's equations for general second order linear differential equation. **[2]**

Q2) a) Explain method of undetermined coefficients. **[5]**

b) Solve the differential equation **[3]**

$$\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 6e^x$$

c) Explain Laplace equation in cylindrical form. **[2]**

Q3) a) Find the Laurent and Taylor series expansion of **[5]**

$$f(Z) = \frac{-2Z+3}{Z^2-3Z+2}$$

b) Obtain the Laplace's equation in two dimensions for heat flow. **[5]**

P.T.O.

Q4) a) The personnel department of a company has a records which show the following analysis of its 200 engineers. If one engineer is selected at random from the company. Find **[5]**

i) The probability he has only a bachelor degree.

ii) The probability he has master degree given he is over 40.

Age (Years)	Bacheor's degree	Masters degreee	Total
Under 30	90	10	100
30 to 40	20	30	50
Over 40	40	10	50
Total	150	50	200

b) In a precision bombing attack there is a 50% chance that any one bomb will strike the target. Two direct hits are required to destroy the target completely. How many bombs must be dropped to give 99% chance or better of completely destroying the target. **[3]**

c) Comment on the following: **[2]**

The mean of a binomial distribution is 3 and variance is 4.

Q5) a) Compute the coefficient between X and Y using following data: **[5]**

X	1	3	5	7	8	10
Y	8	12	15	17	18	20

b) Obtain Spearman's formula for the rank correlation coefficient. **[3]**

c) Explain Correlation and Regression analysis. **[2]**

Q6) a) The mean of two single large samples of 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from same population of standard deviation 2.5 inches (Test at 5% level of significance). **[5]**

b) What types of errors are associated in testing hypothesis. **[3]**

c) Distinguish between experimental and extraneous variables. **[2]**

Q7) a) Obtain the eqution of two lines of regression for the following data. Also obtain the estimate of X for Y = 70. **[5]**

X :	65	66	67	67	68	69	70	72
Y:	67	68	65	68	72	72	69	71

b) In a partially destroyed laboratory, record of an analysis of correlation data, the following results are legible: **[5]**

Variance of X = 9. Regression equations:

$8X - 10Y + 66 = 0$, $40X - 18Y = 214$

What are

i) The mean value X and Y.

ii) The correlation coefficient between X and Y.

Q8) a) State the steps in constructing Latin Square. **[5]**

b) Distinguish between statistics and parameters. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4612

[Total No. of Pages : 2

[4860] - 1325

M.E. (Chemical) (Engg.)

PROCESS OPTIMIZATION

(2013 Credit 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) You wish to minimize $f(x) = 2x_1^2 + x_2^2 - 3$ starting at $(x°)^T = [11]$ with the initial direction being $s° = [-4 \; -2]^T$ Find a conjugate direction to the initial direction s°. **[10]**

Q2) a) Explain steepest Descent method. **[5]**

b) What is simplex method and revised simplex method. **[5]**

Q3) Solve the following problem via the Lagrange Multiplier method. Find the maximum and minimum distances from the origin to the curve: $5x_1^2 + 6x_1x_2 + 5x_2^2 = 8$. **[10]**

Q4) a) Explain the optimization of staged and discrate processes. **[5]**

b) Explain the classification of the process optimization problem. **[5]**

Q5) a) Explain the steps used to solve the optimization problem. **[5]**

b) Explain the non - traditional optimization. **[5]**

P.T.O

Q6) a) Explain the difference between GAs and traditional method. **[5]**

b) Find the maximum of the function

$F(x) = 100 - (10 - x_1)^2 - (5 - x_2)^2$ by the simplex method. **[5]**

Q7) a) Explain the successive linear programming method in detail. **[5]**

b) Explain Root - finding optimization method. **[5]**

Q8) Explain the following transformation methods. **[10]**

a) Penalty function method.

b) Sensitivity Analysis.

Total No. of Questions :8]

SEAT No :

P4357

[Total No. of Pages : 2

[4860] - 1326
M.E. (Chemical)
ADVANCED SEPARATION PROCESSES
(2013 Cridit Pattern) (509103) (Semester - I)

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

Instructions to the candidates:

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

Q1) a) Discuss the factors influencing the separation process. **[4]**

b) Why membrane separation process used in a single stage only? **[6]**

Q2) a) What is dead end filtration? Explain its advantages. **[4]**

b) Explain cf electro filtration. **[3]**

c) Explain reverse osmosis. **[3]**

Q3) a) Explain the design aspects of micro filtration. **[4]**

b) Explain Donan dialysis. **[3]**

c) Explain equipments used in dead end filtration. **[3]**

Q4) a) What Fouling? **[4]**

b) Explain liquid Emultion membrane. **[3]**

c) Discuss Gas Permeation. **[3]**

Q5) a) Why application of pervaporation in chemical industry usually hybrid with distillation & reactor? **[4]**

b) Using simple sketch, describe the hybrids of pervaporation- distillation. **[3]**

c) Describe why carbon nantubes are becoming important adsorbent nowadays? **[3]**

P.T.O.

Q6) a) How to select the adsorbents? Explain **[4]**

b) Explain HPLC. **[3]**

c) Explain HPTLC. **[3]**

Q7) a) Describe Ion Exchange chromatography. **[5]**

b) Discuss Electrophoresis. **[5]**

Q8) a) What is Reactive adsorption? **[5]**

b) Explain economics of separation. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4546

[Total No. of Pages : 2

[4860] - 1327
M.E. (Chemical)
RESEARCH METHODOLOGY
(509104) (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 side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume Suitable data, if necessary.***

Q1) a) Describe the different types of research, clearly pointing out the difference between an experiment and a survey. **[7]**

b) Write short note on Rephrasing the research problem. **[3]**

Q2) a) "The task of defining the research problem often follows a sequential pattern". Explain. **[6]**

b) What are the factors that make people to undertake research? **[4]**

Q3) a) Compute the coefficient of correlation between X and Y using the following data:

X	:	1	3	5	7	8	10
Y	:	8	12	15	17	18	20

[6]

b) Explain the limitations of the tests of hypotheses. **[4]**

Q4) a) Briefly describe the important parametric tests used in context of testing hypotheses. How such tests differ from non-parametric tests? Explain. **[5]**

b) Explain the criteria that are expected to be followed by scientific research. **[5]**

P.T.O.

Q5) a) A researcher is concerned about the level of knowledge possessed by university students regarding the history. Students completed a high school senior level standardized history exam. Major for students was also recorded. Data in terms of percent correct is recorded below for 32 students. Set up a table of analysis of variance and calculate F. **[8]**

Education	Business/Management	Social Science	Fine Arts
62	72	42	80
81	49	52	57
75	63	31	87
58	68	80	64
67	39	22	28
48	79	71	29
26	40	68	62
36	15	76	45

b) Explain extraneous variables. **[2]**

Q6) a) Write short note on writing a research proposal. **[5]**

b) How would you differentiate between simple random sampling and complex random sampling designs? Explain clearly giving examples. **[5]**

Q7) a) How is invention defined in the Indian Patent Act which can qualify for grant of a patent? **[6]**

b) What are the characteristics of a good research report? **[4]**

Q8) a) Explain technological forecasting. **[7]**

b) Explain scope of Patent Rights. **[3]**

Total No. of Questions :8]

SEAT No :

P4358

[Total No. of Pages : 2

[4860] - 1328

M.E. (Chemical)

ADVANCED TRANSPORT PHENOMENA

(2013 Credit - Pattern) (Theory) (509107) (Semester - II)

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 of maximum velocity, average velocity, mass flowrate, film thickness and force per unit area from the following equation **[10]**

$$v_z = \frac{\rho g \delta^2 \cos\beta}{2\mu}\left[1-\left(\frac{x}{\delta}\right)^2\right]$$

Q2) a) Derive the equation Navier Stokes equation. Stokes flow equation and Eulers equation from equation of motion for non-isothermal systems.**[5]**

b) Derive the equation for motion in terms of dimensional numbers. **[5]**

Q3) a) A semi-infinite body a liquid with constant density and viscosity is bounded below by a horizontal surface (the xz plane). Initially the fluid and the solid are at rest. Then at time t=0 the solid surface is set motion in the positive x direction with velocity v_0. Find the velocity v_x as function of *y* and 1. There is no pressure gradient or gravity force in the x direction. and the flow is presumed to be laminar. Use the following equations wherever required. **[7]**

$$\frac{dv_z}{dt} = v\frac{d^2v_x}{dy^2} \qquad \eta = \frac{y}{\sqrt{4vt}}$$

P.T.O.

b) Derive equation of motion in terms of the time smoothed velocity turbulent flow and significance of Reynolds Stresses. **[3]**

Q4) a) Derive the expression for overall heat transfer coefficient for of heat conduction through composite wall. **[5]**

b) Derive the expression for maximum temperature rise for heat conduction with an electrical heat source. **[5]**

Q5) a) Derive the equation of energy, starting with the assumptions. **[5]**

b) Develop the equation for the relationship of local pressure to density or temperature in a stream of ideal gas in which the momentum flux and the heat flux are negligible. **[5]**

Q6) a) State the procedure for the developing expression for temperature distribution with more than one independent variables. **[3]**

b) Derive the equation for the macroscopic energy balance. **[7]**

Q7) a) Derive the expression for the local mass flux for diffusion into a falling liquid film (solid dissolution). **[6]**

b) Derive the expression for average concentration profile in liquid phase for diffusion with homogeneous chemical reaction. **[4]**

Q8) Develop the expression for the mole fraction profile xA(y) and the temperature profile T(y), mole fraction and temperatures at both film boundaries. Hot condensable vapor A, is diffusing at steady state through a stagnant film of non-condensable gas B, to cold surface at y=0, where A condenses. Assume ideal gas behavior and uniform pressure. Furthermore assume the physical properties to be constant, evaluated at some mean temperature and composition. Neglect radiative heat transfer. **[10]**

Total No. of Questions :8]

SEAT No :

P4359

[Total No. of Pages : 2

[4860] - 1329

M.E. (Chemical Engineering)

ADVANCED PROCESS CONTROL

(Semester - II) (2013 Credit Pattern) (509108) (End Sem.)

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) Explain the procedure to **[5]**

i) Transform state space model to impulse response form.

ii) Transform domain to frequency response form.

b) What is mathematical model and what is its main utility in process dynamics. **[3]**

c) What are principal uses of four model types. **[2]**

Q2) a) When is empirical modelling the only reasonable approach to employ in developing a process model? **[5]**

b) What are some major advantages and disadvantages of step testing? **[3]**

c) Define antireset wind up. **[2]**

Q3) a) What is a smith predictor and how it is used for controlling time delay systems? **[5]**

b) What are main drawbacks of feed forward control? **[3]**

c) To what process control problem is split range control an appropriate solution? **[2]**

P.T.O.

Q4) a) What is multivariable system? What are some of the major issues that differentiate a multivariable system from a SISO system? **[5]**

b) What is relative gain array? What is it used for? **[3]**

c) How is RGA used for loop pairing? **[2]**

Q5) a) What are three major issues raised by the use of digital computer for control system implementation? **[5]**

b) What is the difference between zero order hold and first order hold? **[3]**

c) What is involved in signal conditioning? **[2]**

Q6) a) Find the z-transformations of following functions. **[5]**

i) $f(t) = 1$

ii) $f(t) = e^{(-at)}$

iii) $f(t) = \sin(wt)$

iv) $f(t) = t$

v) $f(t) = \cos(wt)$.

b) What are various mean by which z - transform inverse can be obtained? **[3]**

c) What is z - transform? **[2]**

Q7) a) In MPC the process model is used for which two central tasks. **[5]**

b) What are typical characteristics of those processes most likely to benefit from MPC? **[3]**

c) What is nonlinear MPC? **[2]**

Q8) a) In what sense is the control of complete chemical plant different from control of single processing unit. **[5]**

b) How does the design of a chemical plant affect its control system? Enumerate all possible effects and provide examples to describe them. **[5]**

Total No. of Questions :8]

P4360

SEAT No :

[Total No. of Pages : 3

[4860] - 1330

M.E. (Chemical)

ADVANCED REACTION ENGINEERING

(Semester - II)(2013 Credit Pattern) (Theory) (509109)

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

Instructions to the candidates:

1) ***Answer total 5 questions from following (any 3 from 1 - 6 questions and questions 7-8 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 single site, dual site and Eley- Rideal mechanisms for surface catalytic reactions. **[5]**

b) Explain the difference between unreacted and shrinking core model with schematic diagrams. **[3]**

c) List the catalytic reactions (any four) **[2]**

Q2) a) Calculate the time needed to completely burn particles of graphite (R_0 = 5 mm, ρ_B = 2.2 gm/cm^3, k_s = 20 cm/sec) in an 8% oxygen stream. For the high gas velocity used, assume that film diffusion does not offer any resistance to transfer and reaction. Assume reaction temperature = 900°C. **[5]**

b) What is RTD? Draw the neat sketch of pulse and step input with their responses. **[3]**

c) Explain the role of heterogeneous catalyst in reaction. **[2]**

Q3) a) The concentration readings given below represent a continuous response to a pulse input into a closed vessel.

t, min	0	5	10	15	20	25	30	35
$C_{pulse,}$ g/L	0	3	5	5	4	2	1	0

P.T.O.

The vessel is to be used as a reactor for decomposition of a liquid A,

$$A \longrightarrow \text{Product}$$

With rate $(-r_A) = kC_A$, $k = 0.307\ min^{-1}$

Estimate the fraction of the reactant unconverted in the real reactor. **[5]**

b) Explain the series of stirred tanks model. **[3]**

c) What is meant by micro and macro fluid? **[2]**

Q4) a) Derive the expression for mass transfer coefficients in packed beds. **[5]**

b) Write the steps for modelling diffusion with reaction. **[3]**

c) Explain the boundary layer around the surface of a catalyst pellet. **[2]**

Q5) a) Calculate the mass flux of reactant A to a single catalyst pellet 1cm 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. $C_{AS} = 0$). The bulk concentration of the reactant is 1.0 *M,* and the free-system liquid velocity is 0.1 m/s. The kinematic viscosity is 0.5 centistoke (cS; 1 centistoke = $10^{-6}\ m^2/s$), and the liquid diffusivity of A is $10^{-10}\ m^2/s$.

Use Frossling correlation: **[5]**

$$Sh = \frac{k_c d_p}{D_{AB}} = 2 + 0.6\ Re^{1/2}\ Sc^{1/3}$$

b) Explain effective diffusivity with equation and each term. **[3]**

c) What is meant by effectiveness factor? **[2]**

Q6) a) Gaseous feed with A and B ($\nu_o = 10\ m^3/hr$) passes through an experimental reactor packed with catalyst ($W = 4kg$). Reaction occurs as follows:

$A + B \longrightarrow R+S \qquad -r_A = 0.6\ C_A C_B\ mol/kg.hr$

Find the conversion of reactants if the feed contains $C_{A0} = 0.1\ mol/m^3$ and $C_{B0} = 10\ mol/m^3$. **[5]**

b) Explain the Thiele modulus? **[3]**

c) Write a performance equation for reaction contacting porous catalyst particles. **[2]**

Q7) a) The second order reaction A $\longrightarrow$ R is studied in an experimental recycle reactor with large recycle ratio. The data recorded are as follows:

Void volume of reactor= 1L

Amount of catalyst used = 3g

Feed to the reactor: ν_o = 1L/h with C_{A0} = 2 mol/L

Concentration of A in the exit stream from the recycle system ($C_A$out)=0.5mol/L

i) Find the rate constant for this reaction.

ii) Calculate the amount of catalyst needed in a packed bed reactor to archive 80% conversion for feed to the reactor: ν_o =1000 L/h and C_{A0} = 1 mol/L. **[5]**

b) Explain the heat effects during reactions porous catalyst. **[3]**

c) List of types of reactor with neat sketch. **[2]**

Q8) a) Gaseous A decomposes on a solid catalyst as per the following reaction:

$$A \longrightarrow R \text{ with } -r_A = k C_A^2$$

A pilot plant scale tubular reactor packed with 2 L of catalyst is fed with 2 m^3/h of pure A at 300°C and 20 atm. 65% of A converted.

It is desired to treat 100 m^3/h of feed gas at 40 atm. and 300°C consisting of 60% A and 40% diluents in a plant to obtain 85% conversion of A. Find the internal volume of the reactor. **[5]**

b) Explain in detail about the fluidized bed reactor. **[3]**

c) Application of reactor design. **[2]**

Total No. of Questions :8]

SEAT No :

P4361

[Total No. of Pages : 2

[4860] - 1331

M.E. (Chemical)

PROCESS MODELLING & SIMULATION

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

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 logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume Suitable data if necessary.***

Q1) a) What are the uses of mathematical models in Chemical engineering applications? **[5]**

b) Give the appropriate correlations and transport equations for Mass, Momentum and Heat transfer. **[5]**

Q2) a) Write the component continuity equations for a perfectly mixed batch reactor (no inflow or outflow) with first order isothermal reactions; **[5]**

i) Consecutive

ii) Simultaneous

b) Derive the equations for liquid Dynamics model of single component vaporizer. **[5]**

Q3) a) Discuss the assumptions involved in the Mathematical Model equations for a Binary distillation column. **[5]**

b) Discuss the assumptions involved in the Mathematical Model equations for a absorption column. **[5]**

P.T.O.

Q4) a) Develop a mathematical model for a counter current double pipe heat exchanger process. **[5]**

b) Explain Design of experiments. **[5]**

Q5) a) Explain constrained optimization problem with example. **[5]**

b) Explain application Of Optimization in Separation techniques. **[5]**

Q6) a) Solve the equation $dy/dx = x + y$ for three iterations by Euler's method with $x(0) = 0, y(0) = 1$ and a step size of 0.1. **[5]**

b) List all assumptions and define all terms for an ice cube is dropped into a hot, perfectly mixed, insulated cup of coffee. **[5]**

Q7) a) Explain the simulation of open loop three isothermal CSTRs using Newton Rapshon method. **[5]**

b) Explain the convergence method for False Position. **[5]**

Q8) a) Discuss the general "Newton - Raphson" algorithm to determine the bubble point temperature for a binary system of components 1 and 2. Assume the system is ideal, Raoult's and Dalton's laws are applicable. **[5]**

b) What is Process Simulation? **[5]**

Total No. of Questions : 8]

SEAT No. :

P4362

[Total No. of Pages : 2

[4860] - 1332

M.E. (Chemical Engineering)

ADVANCED THERMODYNAMICS

(2013 Credit Pattern) (Semester - III) (509114)

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 incipient instability. Derive necessary equations. **[5]**

b) What are the characteristics of the Redlich Kister equation? Explain all the terms. **[5]**

Q2) a) Give the equations showing the effect of temperature and pressure on reaction equilibrium constant. **[6]**

b) In a laboratory investigation, acetylene is catalytically hydrogenated to ethylene at 1120ºC and 1 bar. If the feed is an equilmolar mixture of acetylene and hydrogen, what is the composition of the product stream at equilibrium? The reactions: $C_2H_2 \rightarrow 2C + H_2$ and $2C + 2H_2 \rightarrow C_2H_4$. Hence adding the two reactions the overall reaction is $C_2H_2 + H_2 \rightarrow C_2H_4$. Take $K_I = 4 \times 10^5$ and $K_{II} = 2.5 \times 10^{-6}$. **[4]**

Q3) a) What is the probability that 2 moles of water originally at 50ºC will spontaneously separate into I mol water at 49ºC and one mole at 51ºC. $C_p = 75$ J/K mol. **[4]**

b) What is a fluctuation? **[2]**

c) Calculate the relative number of distinguishable states in ice and water at 273K. $\Delta H_{fus} = 6$kJ/mol at 273 K and $k = 1.38 \times 10^{-23}$ J/K. **[4]**

P.T.O.

Q4) a) Write short note on strong and weak electrolytes and explain degree of dissociation. **[5]**

b) How is the activity in an electrolyte measured from freezing point method? **[5]**

Q5) a) Write short note on the first and second order transitions with neat sketches of phase diagrams. **[5]**

b) Write a note on Position disorder in a system. **[5]**

Q6) a) Explain the concept of surface properties and derive equations for all the thermodynamic surface properties. **[5]**

b) Explain the two approaches in finding the effect of centrifugal field on concentration and give the relevant equation. **[5]**

Q7) a) Explain the phenomena of entropy generation in irreversible thermodynamics. **[5]**

b) Derive the expression for first law of thermodynamics for open system assuming system behaves irreversible. **[5]**

Q8) a) Derive the barometric formula and calculate the relative pressure at a height of 9km if average molecular weight of air is 0.029 kg/mol and the temperature is 273.15K. **[6]**

b) What are superconductors? **[4]**

Total No. of Questions : 8]

SEAT No. :

P4547

[Total No. of Pages : 2

[4860] - 1334

M.E. (Environmental Engineering)

APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERS

(509131) (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 logarithmic tables slide rule, mollier charts, electronic pocket calcualtor and steam tables is allowed.***
5) ***Assume Suitable data, if necessary.***

Q1) a) Find out the value of quartile deviation and its coefficient from following data:

Roll No.	10	2	3	4	5	6	7
Marks	20	28	40	12	30	15	50

[4]

b) State the tests which are applied to ascertain whether the distribution is skewed and also state the test when skewness is absent. **[3]**

c) Distinguish between mean deviation and standard deviation. **[3]**

Q2) a) Discuss the procedure for calculating the mean from ungrouped data. **[4]**

b) In view of measures of dispersion explain

i) Range

ii) Mean deviation

iii) Standard deviation **[3]**

c) Explain coefficient of variance. **[3]**

Q3) a) After a shift of origin and change of scale, a frequency distribution of a continuous variate takes the form as under:

Step deviation :	–4	–3	–2	–1	0	1	2	3
Frequency (f) :	2	5	7	13	21	16	8	3

If the mean and variance of the distribution are respectively 21.9 and 63.9725, find the original frequency distribution. **[4]**

b) What is t-distribution. **[3]**

c) Distinguish between statistic and parameter. **[3]**

P.T.O.

Q4) a) An experiment was designed to study the performance of four detergents. The following "whiteness" readings were obtained with specially designed equipment for 12 loads of washing distribution over three different models of washing machines:

	Machine I	MachineII	MachineIII	
Detergent A	45	43	51	139
Detergent B	47	46	52	145
Detergent C	48	50	55	153
Detergent D	42	37	49	128
Total	182	176	207	565

Looking on the detergents as a treatments and the machines as blocks, obtain the appropriate analysis of variance table and at the 0.01 level of significance, whether there are differences in detergents or in the washing machines. **[4]**

b) What types of errors are associated in testing of hypothesis. **[3]**

c) What is degree of confidence and confidence limits. **[3]**

Q5) a) Elaborate model equation for latin square design. **[4]**

b) Comment on factorial experimentation with suitable example. **[3]**

c) Establish relation between t and F distribution. **[3]**

Q6) a) What is multiple regression. **[4]**

b) Explain stepping stone method. **[3]**

c) What is transportation model. **[3]**

Q7) a) Explain stratified sampling and systematic sampling. **[5]**

b) Write note on Degeneracy in transportation problem. **[5]**

Q8) a) What are the basic steps in constructing a linear programming model. **[5]**

b) Explain the degeneracy in simplex method. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4548

[Total No. of Pages : 2

[4860]-1335

M.E.(Environmental Engineering)

ENVIRONMENTAL MANAGEMENT

(509132)(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) ***Black 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) Discuss various environmental management tools in detail. **[4]**

b) Explain Ecosystem and vole of environmental policies. **[3]**

c) What are the advantages of environmental auditing. **[3]**

Q2) a) What are the subsystems of environment.What is its impact on business. **[4]**

b) Explain evolution of EIA in india. **[3]**

c) What is 74th amendment of the constitution. **[3]**

Q3) a) Explain audit methodology velated to environmental auditing. **[4]**

b) Explain socio-economic aspects of sustainable developement .**[3]**

c) What are the directive principle of state policy. **[3]**

Q4) a) Discuss how the bill is issued in parliament and how it becomes an Act. **[4]**

b) Explain command and control regulation. **[3]**

c) What are different environmental Acts. **[3]**

P.T.O.

Q5) a) Explain fundamental rights and duties of indian citizen. **[4]**

b) What is eco- mapping. **[3]**

c) Discuss safety related rules. **[3]**

Q6) a) Explain the steps in the rule notification. **[4]**

b) What are the regative environmental externalities related to agriculture. **[3]**

c) Enlist different factory Act passed by indian Parliament. **[3]**

Q7) a) What is carbon trading. **[5]**

b) What is the role of state pollution control board for sustainable growth. **[5]**

Q8) a) What role is played by ministry of environment and forest in conservation of environment . **[5]**

b) Discuss general features of the annual report of the ministry of environment and forests for the current year. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4363

[Total No. of Pages : 2

[4860] - 1336

M.E. Chemical (Environmental)

ENVIRONMENTAL CHEMISTRY

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

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

Instructions to the candidates:

1) ***Answer any Five questions***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) What are Heavy Metals? **[5]**

b) Discuss the effects of Heavy Metals on humans. **[5]**

Q2) a) Show diagrammatically how heavy metals enter into the eco system. **[5]**

b) Explain the environmental significance of colloids and coagulation. **[5]**

Q3) a) What type of suspended particulate matter as pollutants in the water? Explain how they are analyzed. **[5]**

b) What are different Water quality parameters? Explain. **[5]**

Q4) a) What is Green House Effect? Explain with neat diagram. **[5]**

b) Explain different CO_2 capture methods. **[5]**

Q5) a) Explain photochemical smog. **[5]**

b) Give the formation of photochemical smog. **[5]**

P.T.O.

Q6) a) Explain ozone layer depletion. **[5]**

b) Write in short about Acid Rain. **[5]**

Q7) a) What is the cause of alkalinity of soils? What are the disadvantages of alkaline soils? **[5]**

b) List various active and passive factors affecting formation of soil. What are ectodynamorphic and endo-dynamorphic soils? **[5]**

Q8) a) What do you understand by cation exchange capacity of soils? How it is determined? In which unit it is expressed? **[5]**

b) Write short note on Nano materials. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4364

[Total No. of Pages : 2

[4860] - 1337

M.E. (Environmental Engg. BOS : Chemical Engg.)

RESEARCH METHODOLOGY

(2013 Credit Pattern) (Semester - I) (509134)

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 the meaning of research? Why one should do research? What are motivations for conducting research. **[5]**

b) What do you mean by term Research Methodology? Explain in brief its significance. **[5]**

Q2) a) Discuss various steps to be followed in process of engineering research work? Which step you feel most important from engineer's point of view out of all steps. **[5]**

b) What ethics should be followed by any researcher while conducting any research work? Discuss APA ethics code in details. **[5]**

Q3) a) What do you mean by a 'case study'? Explain the steps involved in designing a case study to solve a research problem. **[5]**

b) What is importance of Literature survey in research? How it is conducted? Write names of 5 top referred journals in environmental engineering field which are used for literature survey. **[5]**

Q4) a) Explain various steps in process of engineering research work. **[5]**

b) Discuss fundamentals of time series analysis and spectral analysis along with one application in research work. **[5]**

P.T.O.

Q5) a) Discuss the process of design of experiments for conducting research. Discuss basic principles of design. **[5]**

b) How error analysis is done? What is percentage of generally limit allowed about error? **[5]**

Q6) a) Discuss the significance of a research report and important points in research report. **[5]**

b) What do you understand by "Intellectual Property Rights (IPR)"? What is importance of IPR in research work? What benefits researcher can receive through generation of IPR? **[5]**

Q7) a) "Date interpretation is fundamental component in research process". Justify this statement by giving suitable reasoning and examples to support your answer. **[5]**

b) Discuss importance of trademark and copyrights. **[5]**

Q8) a) Write notes on: (Any Two) **[5]**

i) Threats and challenges to good research.

ii) Citation methods in research.

iii) Sample outline of any research paper.

b) Discuss role of computers in research work and how it helps to get results. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4549

[Total No. of Pages : 2

[4860]-1338

M.E.(Environmental Engineering)

WASTEWATER TREATMENT AND DESIGN

(2013 Credit Pattern) (Semester-II)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***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 reaction kinetics in detail. **[4]**

b) Explain basic principle of mass transfer. **[3]**

c) What is Gas-liquid mass transfer process. **[3]**

Q2) a) Explain two film theory for gas-liquid interface. **[4]**

b) Explain stability of colloids. **[3]**

c) Discuss flocculation theory. **[3]**

Q3) a) Explain TSA in the process of adsorption. **[4]**

b) State the classification of filtration system. **[3]**

c) Explain back wash hydraulics. **[3]**

P.T.O.

Q4) a) Determine the design criteria for an activated sludge process to achieve essentially complete nitrification when treating domestic water.Assume that the following conditions apply for this example. **[4]**

Influent flow rate = 0.90 Mgal/d (3400m^3/d)

BOD after primary settling=200 mg/l

TKN after primary settling = 40 mg/l

Minimum sustainable temperature =15 °C

DO = 2.5 mg/l

b) What are ion exchange materials. **[3]**

c) Discuss various methods used for the removal of toxic compounds. **[3]**

Q5) a) What do you mean by ideal disinfectant. **[4]**

b) Explain estimation of ozone dosage. **[3]**

c) What is UV disinfection. **[3]**

Q6) a) Discuss different types of biological treatement processes. **[4]**

b) Explain conventional activated sludge process. **[3]**

c) What are the objectives of biological treatment. **[3]**

Q7) a) Explain principle and design of trickling filter. **[5]**

b) What are different types of anaerobic reactors. **[5]**

Q8) a) What are different types of settling explain in brief. **[5]**

b) Explain the design of clarifiers. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4365

[Total No. of Pages : 2

[4860] - 1339

M.E. Chemical (Environment)

SOLID WASTE MANAGEMENT

(2013 Credit Pattern) (Semester - II) (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) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Describe the problems associated with solid waste disposal. **[5]**

b) Discuss various characteristics of municipal solid waste. **[5]**

Q2) a) What are the ill effects of open dumping of solid waste? **[5]**

b) What are the methods of onsite storage and handling of solid waste? **[5]**

Q3) a) Describe various types of collection system of solid waste. **[5]**

b) What are the various facilities that must be available at transfer station? **[5]**

Q4) a) Describe the term “sorting of solid waste”. **[5]**

b) Describe the various guidelines for selection of a landfill site. **[5]**

Q5) a) What are the various phases of operation of landfill? Draw the neat sketch of a landfill. **[5]**

b) Why incineration is considered better than open burning? **[5]**

P.T.O.

Q6) a) Describe the nature of solid waste generated by different industries. **[5]**

b) Suggest various methods for reducing the solid waste generation in the industries. **[5]**

Q7) a) Write short notes on Recovery of energy and material. **[5]**

b) Write short notes on Disposal of Industrial Waste. **[5]**

Q8) a) What is Vermicomposting? **[5]**

b) Describe the various factors affecting composting. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4366

[Total No. of Pages : 2

[4860] - 1340

M.E. (Chemical) (Environmental Engineering)

INDUSTRIAL WASTE TREATMENT

(2013 Credit 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) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Discuss the characterization and quality requirements of Industrial Water. **[5]**

b) Explain the reuse and recycling concept in water management. **[5]**

Q2) a) Discuss the treatment technique for removal of heavy metals from Industrial Waste. **[5]**

b) Explain the oil & grease removal method from industrial waste water. **[5]**

Q3) a) Write a Note on water budgeting. **[5]**

b) Give the distinction between clean up and cleaner technologies. **[5]**

Q4) Draw the Flow sheet and discuss the sources, characterization and treatment of waste water in Dairy industries. **[10]**

P.T.O.

Q5) The BOD results given below are observed on a sample of waste water. **[10]**

time, days	1	2	4	6	8	10
BoD, Mg/lit	6.5	11	18	22	24	26

a) Plot BoD curve.

b) Determine parameters K_1 & Lu.

Q6) a) Discuss the cost-benefit analysis of common effluent treatment plant. **[5]**

b) Explain the concept and design of common effluent treatment plant. **[5]**

Q7) Draw the flowsheet for treatment method of sugar waste and discuss the cost-benefit analysis. **[10]**

Q8) Write Short Notes on: **[10]**

a) Oxidation pond.

b) Advanced waste water Treatments.

Total No. of Questions : 7]

SEAT No. :

P4550

[Total No. of Pages : 2

[4860] - 1341

M.E. Chemical (Environmental Engg.)

REMOTE SENSING & GIS APPLICATIONS IN ENVIRONMENTAL ENGINEERING

(2013 Credit Pattern) (Semester - III) (509143)

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

Instructions to the candidates:

1) ***Answer any 5 of the following questions.***
2) ***Neat diagrams should be drawn wherever necessary.***
3) ***Figures to right indicate full marks.***

Q1) a) What is Remote Sensing & its various application. **[4]**

b) Explain Electromagnetic spectrum & discuss briefly Maxwell magnetic theory. **[6]**

Q2) a) What are spectral reflectance curves? Explain the spectral reflectance for water and sand. **[6]**

b) Explain atmospheric scattering & atmospheric window. What are the different types of scattering? **[4]**

Q3) a) What are the different satellite system parameters used to describe function & operation of Remote Sensing System & explain any one. **[6]**

b) Describe the characteristics of IRS. **[4]**

Q4) a) What is FCC image & its utilization. Explain its advantages. **[5]**

b) List out be fundamental picture elements & explain any two elements. **[5]**

P.T.O.

Q5) a) What is the digital image processing & its uses Explain **[6]**

i) Image transformation &

ii) Image filtering.

b) Explain supervised & unsupervised classification. **[4]**

Q6) a) What are the components of GIS & explain the hardware & software elements. **[4]**

b) Write note on **[6]**

(i) DBMS

(ii) GIS software.

Q7) a) What be different data required in the study of Natural resources management & water pollution. **[4]**

b) Write note on any 2 of the following. **[6]**

i) Development of land use/Land cover maps of any region.

ii) Vector model.

iii) Attribute.

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Total No. of Questions : 8]

SEAT No. :

P4551

[Total No. of Pages : 2

[4860] - 1342

M.E. Chemical (Environmental Engineering)

INDUSTRIAL POLLUTION PREVENTION & CLEANER PRODUCTION

(2013 Credit Pattern) (509144) (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) ***Assume suitable data, if necessary.***

Q1) a) Discuss the industrialization and sustainable development. **[5]**

b) What are the Indicators of the sustainability? **[5]**

Q2) a) Explain the cleaner technology and cleaner production concept. **[5]**

b) Discuss the Prevention versus Control of Industrial Pollution. **[5]**

Q3) a) Discuss historical evolution of pollution prevention and control. **[5]**

b) Explain the Environmental Management Hierarchy. **[5]**

Q4) a) What is the role of Internet information for pollution prevention & cleaner production. **[5]**

b) Discuss the source reduction techniques in pollution control. **[5]**

Q5) Discuss the following in detail; **[10]**

a) PP and CP Financing.

b) Waste Audit-Environmental Statement.

P.T.O.

Q6) Discuss the process and equipment optimization aspect in pollution prevention & cleaner production. **[10]**

Q7) Discuss the technical and environmental feasibility analysis alongwith total cost analysis of pollution prevention & cleaner production program. **[10]**

Q8) Write short note on; **[10]**

a) Environmental Audit.

b) Elements of Life Cycle Assessment (LCA).

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SEAT No :

Total No. of Questions :7]

[Total No. of Pages : 3

P4552

[4860] - 1343

M.E. (Petroleum Engineering)

NUMERICAL SIMULATION IN PETROLEUM ENGINEERING

(2013 Credit Pattern) (512101) (Semester - I)

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

Instructions to the candidates:

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

Q1) a) With help of relevant examples discuss the importance of numerical methodologies applied in Upstream Industries. How does this differ from conventional analytical techniques? **[5]**

b) Solve the following series of linear algebraic equation with help of any numerical technique: **[5]**

$$2x + 3y + z = 9$$
$$x + 2y + 3z = 6$$
$$3x + y + 2z = 8$$

Q2) a) Find a real root of the system of equations. **[5]**

$$x^2 - y^2 = 3$$
$$x^2 + y^2 = 13$$

b) Write a detailed note on History Matching Technique with a special emphasis on the Regression Analysis. **[5]**

Q3) a) Write a short note on Darcy flow through porous media. How does the governing equation changes considering the multiphase aspects of the reservoir. **[3]**

P.T.O.

b) Constant flow out of one end of a closed linear reservoir can be represented by following partial differential equation. **[7]**

$$\frac{\partial^2 p}{\partial x^2} = \frac{\varphi \mu c}{0.00633\, k} \frac{\partial p}{\partial t}$$

I.C. $p(x,0) = p_i$

B.Cs @ x = L $\qquad \frac{\partial p}{\partial x} = 0$

at x = 0, $\quad q = \frac{0.00633kA}{B\mu} \frac{\partial p}{\partial x}$

Obtain the pseudo-steady state solution.

Calculate $p(0, t)$ and $p(L, t)$ at t = 30 days

Data: p_i = 2000 psi, Δx = 500 ft, A = 500 ×25 ft^2, k = 150 md, L =4500 ft, IMAX = 10 grid points, μ = 5 cP, B = 1.1 rcf/scf, φ = 0.2, c = 30 ×10^{-6} psi^{-1} q = 561.5 scf/d.

Q4) a) Name three important Commercial Simulators and discuss their relative advantage and disadvantages. **[3]**

b) Write a short note on accuracy and stability of numerical solutions. **[3]**

c) With help of suitable diagram explain modeling and simulation aspect of the Geothermal Reservoir. **[4]**

Q5) a) Write a short note on the major challenges faced by Reservoir Simulation Packages while dealing with real life reservoir data. How to address the issues. **[3]**

b) Solve the following reservoir equation: **[5]**

$$\frac{\partial^2 u}{\partial t^2} = 4 \frac{\partial^2 u}{\partial x^2}$$

Subject to the conditions

$u(0,t) = 2$

$u(4,t) = 4.8$

$u(x,0) = x\ (2.6 - x)$

$\frac{\partial u}{\partial t} = 0$ at t = 0

c) What is compositional model? **[2]**

Q6) a) Obtain the discretized expression of the following reservoir equation based on both implicit and explicit techniques. **[4]**

$$\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial x}$$

Where ICs $u\ (0< x < 1, 0) = x$

$$u(1< x < 2, 0) = 2 - x$$

BCs u (0,t) = 0

u (2, t) = 0

b) What is IMPES formulation? **[2]**

c) Derive black oil model equations using compositional model equation. **[4]**

Q7) a) Solve using any suitable method **[4]**

$$\frac{dy}{dx} = 3x + 0.5\ y$$

with y(0) = 1.

b) Name three different techniques often followed to solve partial differential equations numerically. Explain any one methodology in details. **[3]**

c) With help of case study explain multiphase flow behavior in reservoir. In this context also highlight single and multi component transport. **[3]**

Total No. of Questions : 8]

SEAT No. :

P4553

[Total No. of Pages :3

[4860] -1344

M.E. (Petroleum Engineering)

GEOLOGY IN RESERVOIR DESCRIPTION

(2013 Credit Pattern) (Semester - I) (512102)

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

Instructions to the candidates:

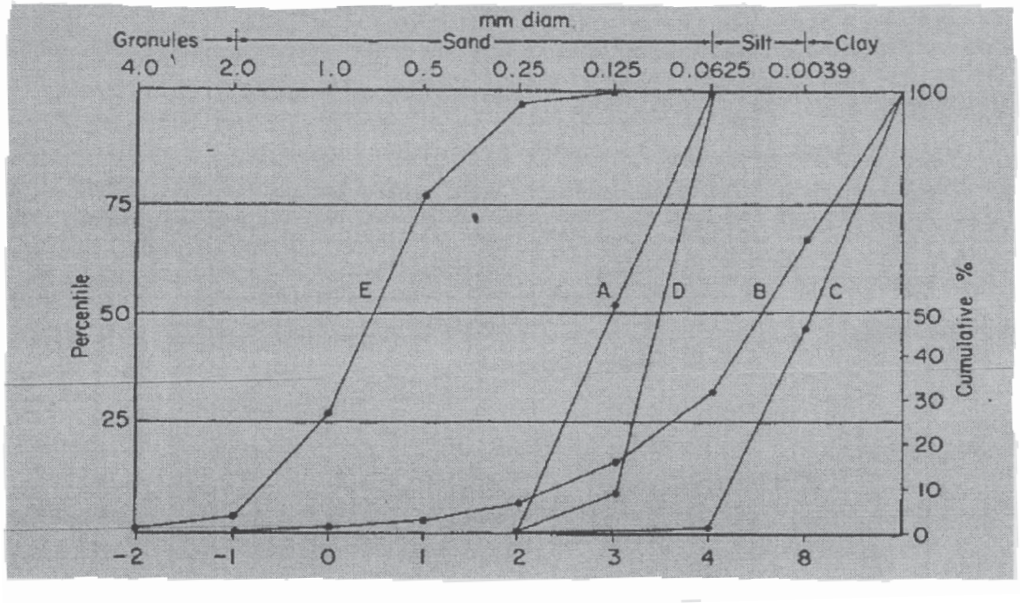
1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume additionol data is required.***

Q1) a) Describe in brief triangular classification of sedimentary rocks involving sand-lime-clay/mud. **[4]**

b) Draw and explain in brief normal sedimentation process. **[4]**

c) What is a passive and an active continental margin? **[2]**

Q2) a) A graph of cumulative frequency distribution (CFD) is given for grain size variation to understand sorting of five samples. **[5]**



Compare curves of different samples and comment on sorting of sediments. Assuming the grain size is proportional to pore size, rank them from good to poor quality?

P.T.O.

b) Draw and describe standard relative permeability curve for oil and water. **[3]**

c) What is a coulomb failure and a Von Mises failure in rocks? **[2]**

Q3) a) How does knowledge of shale volume help better understand porosity permeability trend with increasing depth? **[4]**

b) What are the qualities of a reservoir rock? **[3]**

c) Describe in brief Dunham scheme of classification of carbonate rocks. **[3]**

Q4) a) Porosity permeability variation with increasing depth is given in following table. Plot a graph and comment on porosity permeability variation with increasing depth. **[5]**

Depth	Porosity	Permeability	Depth	Porosity	Permeability
3275	21.30	350.00	3293	24.04	121.87
3277	24.70	6495.00	3295	28.11	703.32
3279	24.20	353.00	3297	16.37	932.78
3281	27.70	2400.00	3299	24.04	1628.44
3283	27.40	1545.00	3301	30.00	216.00
3285	25.40	2085.00	3303	24.80	1944.00
3287	22.90	2500.00	3305	26.06	1560.88
3289	23.90	2647.00	3307	26.89	45.86
3291	25.82	625.00	3309	21.36	24.00

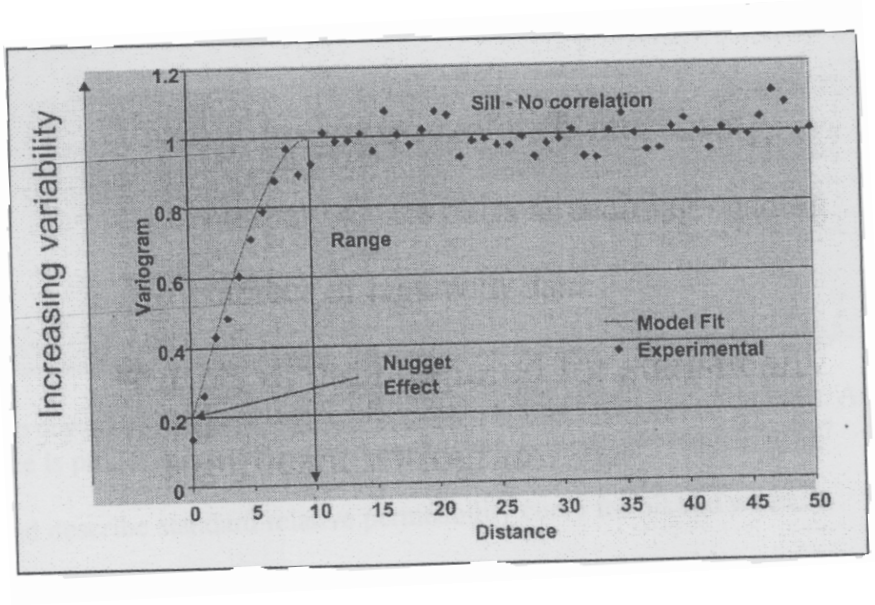
Table 1 for Q.4b.

b) Use above table to calculate hydraulic units from the data. How many flow units can be recognized here? **[5]**

Q5) a) Comment on the surface area model and pore size model focusing on constraints associated with each. **[5]**

b) Draw a sketch map showing the condition that the fault trace length is higher than interwell region. What impact this will have on reservoir withdrawal and efficiency? **[5]**

Q6) a) Explain Range, Sill and Nugget using following diagram. What is a significance of nugget value in the given diagram? **[5]**



b) How is geometric and zonal anisotropy recognized using variogram? **[5]**

Q7) a) Define following terms. **[4]**

i) Original Oil in place

ii) Abnormal pressure zone

iii) Oil Wet Reservoir and withdrawal efficiency

iv) Petroleum system.

b) What is Net to Gross thickness ratio? What are the parameters to decide this? **[3]**

c) Draw and explain in brief cyclic sedimentation. **[3]**

Q8) a) Calculate the amount of oil present in a reservoir covering an area of 600 acres with an average thickness of 10 ft. The average porosity is 20%, formation volume factor is 1.22, and water saturation is 30%. **[5]**

b) What is meant by P10, P50 and P90 in reserves estimation? Explain your answer using above example. **[5]**

Total No. of Questions : 7]

SEAT No. :

P4367

[Total No. of Pages : 2

[4860] - 1345

M.E. (Petroleum Engineering)

ADVANCED DRILLING ENGINEERING

(2013 Credit Pattern) (Semester - I) (End Sem.)

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

Instructions to the candidates:

1) ***Answer any Five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain drilling fluid circulation system of an oil well drilling rig with illustrative sketch. **[6]**

b) Discuss different functions of drilling fluid in brief. **[4]**

Q2) a) What are different types of Multilateral wells? **[4]**

b) What is dogleg and key seat? **[3]**

c) Discuss various types of horizontal well completion methods. **[3]**

Q3) a) A production string is to be cemented using class G cement. Cementing recipe is Tail slurry weight 15.8ppg, slurry yield 1.15ft^3/sack, water requirement/sack = 5.0 gals.

Data given as,

Depth of hole = 3,200 m

Av. Diameter 8.625", Drilling fluid weight 10ppg

Casing –7" Liner, ID 6" shoe depth 3,200m, Shoe track length 36m, Liner hanger top 150m inside 9-5/8" casing, 9-5/8" casing shoe depth 2900m, ID = 8.62". Top of cement is liner hanger top. **[6]**

Determine:

i) Quantity of cement needed for tail slurry.

ii) Volume of mix water.

iii) Displacement volume.

b) Discuss primary cementation process in detail. **[4]**

P.T.O.

Q4) a) Discuss casing shoe depth selection procedure in detail. **[6]**

b) Discuss different types of casings, grades, range and threads in detail. **[4]**

Q5) Discuss balance tangential method of survey and Find out increment in Vertical, North and East increment using following data, **[10]**

Measured depth ft.	Inclination deg.	Azimuth deg.
2000	2.0	45
2090	4.5	50

Q6) a) Write short note on: **[8]**

i) MWD.

ii) BOP.

b) Discuss how to find rheological properties of mud using Fann viscometer. **[2]**

Q7) a) Discuss geometry of 'S' type directional well with suitable sketch. **[6]**

b) Discuss drill string design considerations in detail. **[4]**

Total No. of Questions : 8]

SEAT No. :

P4368

[Total No. of Pages : 2

[4860] - 1346

M.E. (Petroleum Engineering)

RESEARCH METHODOLOGY

(2013 Credit Pattern) (Semester - I) (512104)

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 with suitable example steps in research process. **[3]**

b) Differentiate clearly between research problem, research topic and research questions by giving suitable example(s). **[3]**

c) What is a research problem? Define the necessity of identifying a research problem. Also briefly examine the sources of research problem. **[4]**

Q2) a) Formulate a research plan for investigating any petroleum engineering problem of your choice and explain important steps involved in it. **[4]**

b) Explain the meaning and significance of a research design. **[4]**

c) State the importance of hypothesis in scientific research. **[2]**

Q3) a) Examine the merits and demerits of the observation method in data collection. Illustrate your answer with suitable examples. **[4]**

b) What are the guiding considerations in the construction of questionnaire? Explain. **[4]**

c) Comment on the statement: "A question well-stated is a question half-answered". **[2]**

P.T.O.

Q4) a) Describe the various data collection techniques and state their uses and limitations. **[4]**

b) State the differences between quantitative and qualitative research methods by giving appropriate examples. **[4]**

c) Explain the importance of citations in research. **[2]**

Q5) a) Write a comprehensive note on: "Ethics in research". **[4]**

b) Write the steps involved in report writing and elaborate the importance in effective report writing. **[4]**

c) Differentiate between applied research and fundamental research with researcher's qualities. **[2]**

Q6) a) What is a blog? Explain the different steps in creation of blog. Mention also popular blogging sites. **[4]**

b) Explain in brief the structure and format of scientific research article. **[3]**

c) Write a brief note on: "Current Trends in Research". **[3]**

Q7) a) What is literature review? State Creswell's five steps to conduct literature review. Discuss the various sources of literate review. **[5]**

b) What is need of research design? Discuss in brief various types of research designs. **[5]**

Q8) a) Write notes on: (**Any Two**) **[5]**

i) Threats and challenges to good research.

ii) Intellectual Property Rights (IPR).

iii) Interview method for data collection.

b) Explain Trade secrets, Licensing and Technology Transfer (TOT) with stakeholder groups for oil and gas industry. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4369

[Total No. of Pages : 2

[4860] - 1347

M.E. (Petroleum Engineering)

ADVANCED RESERVOIR ENGINEERING

(2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

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

Q1) a) Derive the continuity equation in radial coordinates. **[5]**

b) How would you compute the GOC and OWC using permeability vs. saturation data? Explain in detail. **[3]**

c) What do you mean by relative permeability to a particular fluid? Is it the same from the one which is used in Darcy law? **[2]**

Q2) a) What do you mean by the diffusivity equation? What are the assumptions that are used to derive the same? **[5]**

b) What do you mean by discretization? Why and how do you discretize? What are the advantages and disadvantages of discretization? **[3]**

c) Explain in detail what is meant by equation of state? **[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 fire-flooding. **[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, along with various points on it. **[5]**

b) Explain in detail 5 fluid properties for oil, and how they vary with pressure and temperature. **[3]**

c) How is production from a retrograde condensate reservoir different from that of a normal reservoir? Explain in with the help of a diagram. **[2]**

Q5) a) Draw the relative permeability curves for an oil-wet rock and a water-wet rock. Explain how they are different from each other. **[5]**

b) Explain the advantages, disadvantages, and screening criteria for in-situ combustion. 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. Which gas is used in this method? **[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) Buckley-Leverett Theorem. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4370

[Total No. of Pages : 2

[4860] - 1348

M.E. (Petroleum Engineering)

ENVIRONMENTAL TECHNOLOGY IN PETROLEUM ENGINEERING

(2013 Credit Pattern) (Semester - II) (512108)

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

Instructions to the candidates:

1) ***Attempt Any Five questions.***
2) ***Figures to the right side indicate full marks.***
3) ***Illustrate your answers with suitable examples and diagrams, wherever necessary.***
4) ***Write relevant question number before writing the answer.***

Q1) a) Explain significance of Environmental Management System. **[4]**

b) Explain the pretreatment methods implemented for treatment of produced water. **[3]**

c) Discuss Current environmental issues faced by oil and gas industry. **[3]**

Q2) a) Write a note on : Quality Environment Management: Planning and resource allocation. **[4]**

b) Describe the types of audits involved in environment management of oil Industry. **[4]**

c) Write a note on 'Clean Development Mechanism'. **[2]**

Q3) a) Write a note on "Integrated Environmental Biotechnology in Petroleum Industry. **[4]**

b) What are the causes of oil spills? Describe chemical methods to prevent oil spills. **[4]**

c) Write a brief note on : Disaster management in oil Industries. **[2]**

P.T.O.

Q4) a) Describe the environment and safety related issues regarding high sulfur crude and high sulfur natural gas. **[4]**

b) How NORM is produced through petroleum operations? What precautions are taken for handling and disposal of NORM? **[4]**

c) Explain meteorological Aspects of Air Pollutant Dispersion. **[2]**

Q5) a) Write a brief note on : HAZOP and HAZAN. **[4]**

b) Discuss in brief the principles involved in Hazard Identification. **[4]**

c) Explain the principles in ALARP. **[2]**

Q6) a) Explain the terms with Suitable examples: **[4]**

i) JSA,

ii) PTW

b) What is Quality Risk Analysis (QRA)? Explain the importance in Oil and gas Sector. **[4]**

c) Explain in brief principles involved in ATR (Action Taken Report). **[2]**

Q7) a) Write brief note on: (***Any Two***) **[5]**

i) Environmental impact assessment.

ii) Preventive measures in Oil industry for fire and explosion hazards.

iii) Decommissioning of oil and gas installations.

b) Discuss Health and Safety laws applicable in Oil and Gas Industries. **[5]**

Q8) a) Discuss Current environmental issues faced by oil and gas industry. **[5]**

b) Describe the environment and safety related issues regarding high sulfur crude and high sulfur natural gas. **[5]**

Total No. of Questions :8]

SEAT No. :

P4554

[Total No. of Pages :2

[4860]-1349
M.E. (Petroleum)
ADVANCED PRODUCTION ENGINEERING
(512109) (2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***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 artificial lifting technology? Explain different methods of it in brief. **[5]**

b) Draw neat schematic sketch of surface and subsurface equipment of an Electrical pumping system. **[3]**

c) Explain the need of artificial lifting. **[2]**

Q2) a) Discuss the various design considerations for surface production facility in detail. **[5]**

b) Write the procedure for design of single point, continuous gas lifting technique. **[3]**

c) State and explain the equations to design a three phase horizontal separator. **[2]**

Q3) a) Draw neat schematic sketch of a typical petroleum production system and write inflow and outflow equations for at least three nodes in it. **[4]**

b) Draw neat schematic sketch of a three phase vertical separator and write its advantages. **[4]**

c) Explain, PI and IPR in brief. **[2]**

P.T.O.

Q4) a) Discuss in brief different methods to treat produced emulsions. **[5]**

b) Draw neat schematic sketches of necessary instrumentation and process control features that may be required in a separator. **[3]**

c) In which kind of field conditions you will recommend horizontal separators? Explain. **[2]**

Q5) a) Write usability of gas lifting, PCP and hydraulic lifting only in terms of excellent/ good/ fair/ poor in a tabular form for following well conditions. Low PI, High GOR, adaptability to deviated wells, capability to produce sand, high volume lift capability and ability to handle viscous oil. **[5]**

b) Describe any one method of well stimulation in detail. **[3]**

c) Draw neat schematic sketch of a vertical heater treater. **[2]**

Q6) a) Write short notes on, skimmer tank and produced water treating system. **[4]**

b) Describe the ideal counterbalanced system to be used in SRP. **[3]**

c) Discuss the working and limitations of plunger lifting technique. **[3]**

Q7) a) What is formation damage? How do you recognize it? Discuss diagnosis and reasons of formation damage, in brief? **[5]**

b) With the help of a neat schematic sketch explain offshore production system. **[5]**

Q8) a) Draw neat schematic sketch of a tubing pressure operated gas lift valve and discuss its working in brief. **[5]**

b) Design a two phase vertical separator using the following data: **[5]**

Gas flow rate (Qg) = 10 MMscf/day. Oil flow rate (Qo) = 1800 bbls/ day. Oil gravity = 42° API. Operating Pressure = 980 psia. Operating Temperature = 60° F. Specific Gravity of Gas = 0.6 . Gas Compressibility = Z= 0.83. From std. graph value of 'k' or drag coefficient Cd = 0.284 (Constant based on liquid gas properties). Liquid drop to be separated = dm = 100 micron. Assume slenderness ratio of 3 & 4 .Retention time 2.5 & 3 minutes.

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Total No. of Questions :8]

SEAT No. :

P4371

[Total No. of Pages :4

[4860]-1350

M.E. (Petroleum Engineering)

ADVANCED WELL TESTING

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

Q1) a) Which equations are used for deriving the diffusivity equation? And why? Explain the significance of each of the equation used. **[5]**

b) What is the use of superposition in time, in well test interpretations? Explain with diagrams? **[3]**

c) What is the difference between transient, pseudo steady state and steady state flow regime? Explain with appropriate diagrams. **[2]**

Q2) a) What do you mean by exponential integral function? Explain its significance in well testing. Draw the function and its log approximation vs. x on a semilog plot. **[5]**

b) Explain the concept of wellbore storage and its impact on solution of diffusivity equation. **[3]**

c) How is gas well testing different from oil well testing? Explain in detail.**[2]**

Q3) a) Given is a dataset for a PBU test. Compute the skin factor, permeability and original reservoir pressure from the data. **[7]**

i) Viscosity - 0.9 cp

ii) Rw = 0.3 ft

iii) Ct = 17 x 10 E-6 psi -1

P.T.O.

iv) Pwf = 1175 psi

v) B = 1.35 rb / stb

vi) Porosity = 20%

vii) Flowrate, q = 400 stb/d

viii) Net pay = 25ft

ix) Tp = 5 days

Shut-in time, Del-t(hr)	**pws(psia)**
0	1150
2	1794
4	1825
8	1857
16	1875
24	1895
48	1910

b) What do you mean by DST? Explain with its different time phases. **[3]**

Q4) a) What is the difference between isochronal and modified isochronal test? **[5]**

b) Explain the various flow regimes which can be encountered during the interpretation of a typical well test data, along with figures and the slopes that are encountered for the respective flow regime. **[3]**

c) Explain what is meant by pseudo pressure. **[2]**

Q5) a) Following data was given for a drawdown test on a well, along with the pressure data given in the table: **[7]**

i) Viscosity - 0.7 cp

ii) Rw = 0.175 ft

iii) Ct = 15 x 10 E-6 psi-1

iv) Pi = 4000 psi

v) B = 1.121 rb / stb

vi) Porosity = 22%

vii) Flowrate, q=150 stb/d

viii) Net pay = 60ft

t(hours)	Pwf (psia)
0	4412
0.12	3717
1.94	3633
2.79	3622
4.01	3611
4.82	3605
5.78	3600
6.94	3594
8.21	3580
9.95	3575
14	3570
17.3	3567
20.7	3561
24.9	3555
30	3549
36	3544
43.5	3535
51.5	3532
61.8	3526
74	3520

Find the permeability and skin from the above data.

b) Explain how the pseudo-pressure function behaves with pressure, with the help of a graph. **[3]**

Q6) a) What slopes are observed in a pressure derivative plot of a fractured horizontal well? **[4]**

b) What do you mean by Nodal Analysis? What is its use, and its application in the oil and gas industry? **[4]**

c) What happens when you change the node position in Nodal Analysis? Explain with graphs. **[2]**

Q7) a) A new oil well produced 400 stb/ day for 2 ± days; then it was shut-in for a pressure buildup test, during which the data in Table below were recorded. The other data were: Bo = 1.25rb/stb, A = 20ft, 0 = 0.20, rw = 0.29 ft, c, = 19.5 x 10^6, and μo = 1.1 cP. From these data, estimate the formation permeability, k, pi, and skin factor s. **[7]**

Shut-in time, Del-t (hr)	Horner Time Ratio	pws (psia)
0	-	1165
2	37.0	1801
4	19.0	1838
8	10.0	1865
16	5.5	1891
24	4.0	1905
48	2.5	1925

b) Write short notes on Fetkovich and Blasingame decline curves. Explain in detail, what do you mean by: **[3]**

Q8) a) Type curves and its usage in well testing. **[5]**

b) Bourdet derivative and its impact on pressure transient analysis. **[5]**

EEE

Total No. of Questions :7]

SEAT No. :

P4372

[Total No. of Pages :2

[4860]-1351

M.E. (Petroleum Engineering)

ADVANCED WELL CONTROL

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

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) Explain Wait and Weight method in detail. **[6]**

b) A vertical well is drilled to a depth of 10,500ft with 11.7ppg mud. **[4]**

Well data,

Pump speed 80 spm

Pressure losses in surface equipment 180 psi, Pressure losses in drill string 900 psi, Pressure losses in annulus 120 psi, Pressure losses in bit nozzles 1600 psi Calculate bottom hole pressure in well static, BHP when mud is circulated at 80 spm, pump pressure when mud is circulated at 80 spm, equivalent circulating density.

Q2) a) Discuss well control considerations in horizontal wells. **[6]**

b) A 3000psi control unit has 20, ten gallon capacity accumulator bottles with a pre charge pressure of 900 psi. How many gallons of usable fluid is available? **[4]**

Q3) a) What do you Understand by closing ratio of ram preventers? **[2]**

b) Explain following situation in well killing operations Plugged or wash bit nozzles. **[4]**

c) What is D exponent? Explain pore pressure prediction by D exponent in brief. **[4]**

P.T.O.

Q4) a) Discuss stripping operation in brief. **[5]**

b) What is leak off test? Describe test procedure. **[5]**

Q5) a) A gas kick is being circulated out. At the time of gas reaches the casing shoe at 4,250ft/4,750ft. the pressure at the top of the bubble is 3000psi. If original mud weight is 12 ppg, what is the casing pressure at the surface? **[3]**

b) Discuss snubbing operation in detail. **[5]**

c) What are early warning signs of kick? **[2]**

Q6) a) Write short note on: **[8]**

i) Underground blow out.

ii) Volumetric method of well control.

b) What is connection gas? **[2]**

Q7) Write short notes on: **[10]**

a) Hydrate formation.

b) BOP control unit.

c) MAASP.

d) Swabbing.

e) Abnormal pressure.

EEE

Total No. of Questions :5]

SEAT No. :

P4373

[Total No. of Pages :4

[4860]-1352

M.E. (Information Technology)

MATHEMATICAL FOUNDATION OF INFORMATION TECHNOLOGY

(2013 Credit Pattern) (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 side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) Solve any two:

a) Given that a student had prepared for examination, the probability of passing a certain entrance exam is 0.99. Given that a student did not prepare, the probability of passing the exam is 0.05. Assume that the probability of preparing the exam is 0.7. The students fail in the exam. What is the probability that he or she did not prepare. **[5]**

b) Consider a DMS with source probabilities. {0.35, 0.25, 0.20, 0.15, 0.05} **[5]**

i) Determine the Huffman code for this source.

ii) Determine the average length $\bar{R}$ of the code words.

iii) What is the efficiency η of the code?

c) 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	8	23	45	65	75	80

P.T.O.

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: $\mu_B(x) = \frac{|(40-x)|}{8} + 1$

Find the followings

i) $A \cup B$

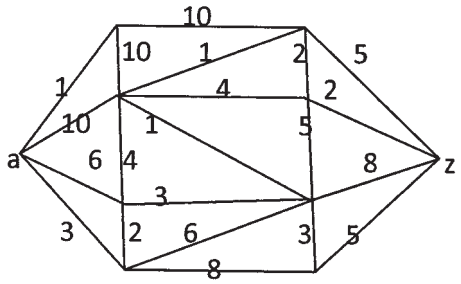
ii) $A \cap B$

iii) $\bar{A}$

iv) $\bar{B}$

v) $\bar{A} \cup \bar{B}$

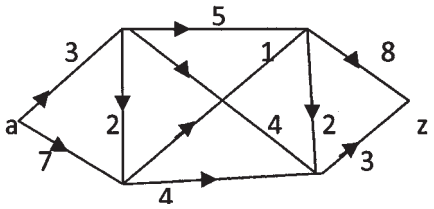
b) Apply Dijkstra's algorithm to determine the shortest path between vertex a to z. **[5]**



c) Two dice are rolled together. What is the probability that the sum of the faces will not exceed 7? Given that at least one face shows a 4? **[5]**

Q3) Solve any two:

a) Use the labeling procedure to find a maximum flow in the given transport network. Determine the corresponding minimum cut. **[5]**



b) Show that C={0000, 0011, 1111} is a linear code. What is it's minimum distance. **[5]**

c) Find the missing frequency. If arithmetic mean is 28 of the data given below. Find the median of the series later. **[5]**

Profit per shop	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	12	18	27	----?----	17	6

Q4) Solve any two:

a) Prove that the entropy for a discrete source is a maximum when the output symbols are equally probable. **[5]**

b) Result of throwing die was recorded as follows. **[5]**

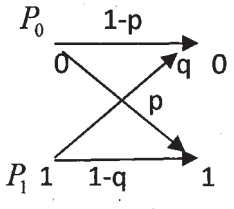
Number falling upwards	1	2	3	4	5	6
Frequency	27	33	31	29	30	24

Is the die unbiased? Answer on the basis of Chi-Square test.

c) 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]**

Q5) Solve any two:

a) Consider a binary channel shown in the figure. Let the a priori probabilities of sending the binary symbol be P_0 and P_1, where $P_0 + P_1 = 1$. Find the a posteriori probabilities P(X=0 | Y=0) and P(X=1 | Y=1) **[5]**



b) 200 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	18	19	23	21	16	25	22	20	21	15

Calculate Chi-square.

c) The membership functions for the linguistic variables "tall" and "short" are give below **[5]**

$$\text{"tall"} = \left\{\frac{0.2}{5} + \frac{0.3}{7} + \frac{0.7}{9} + \frac{0.9}{11} + \frac{1.0}{12}\right\}$$

$$\text{"short"} = \left\{\frac{0.3}{0} + \frac{0}{30} + \frac{1}{60} + \frac{0.5}{90} + \frac{0}{120}\right\}$$

Develop membership functions for the following linguistic phrases

i) Very tall

ii) Fairly tall

iii) Not very short

EEE

Total No. of Questions :8]

SEAT No. :

P4374

[Total No. of Pages :3

[4860]-1353

M.E. (Information Technology)

APPLIED ALGORITHMS

(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 calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Prove by contra positive: if n>0 and 4^n -1 is prime then n is odd. **[2]**

b) Describe tower of Hanoi problem. give its recurrence formula and prove by mathematical induction that its complexity is $2^n - 1$. **[4]**

c) Explain following proof techniques with an appropriate example. **[4]**

i) Direct Proof

ii) Proof by Counter Example

Q2) a) Give the recurrence formula for ternary search. Solve it by using Master Theorem. **[3]**

b) Solve following recurrence **[4]**

$T_n = 1$ if $n = 0$

$T_n = 4T_{n-1} - 2^n$ otherwise

c) State whether statements are correct or incorrect **[3]**

i) $3n + 2 = \Theta(n)$

ii) $2n^2 + 3n + 1 = '\Omega(n)$

iii) $10n^2 + 4n + 2 = O(n^2)$

P.T.O.

Q3) a) Explain with figures the term "CCW". Write C/C++ code to test for CCW. **[2]**

b) Give an algorithm to find the closest pair in 2D. Give its recurrence and solve the same. **[4]**

c) Compare Jarvis March and Graham Scan algorithm for construction of convex Hull. **[4]**

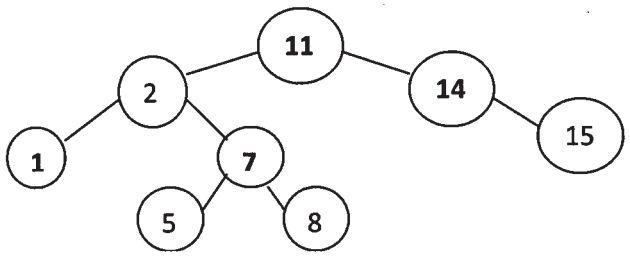
Q4) a) Explain the term Persistent Data structure. Give C/C++ code to insert the item in the Persistent Binary Search Tree. **[3]**

b) Give the algorithm and explain with example following operations on Splay tree. **[4]**

i) Split

ii) Delete

c) Give the RED-BLACK tree obtained after inserting 4 in the following RED-BLACK tree. **[3]**



Note: Keys with values 11,14,1 and 7 are black colored nodes, others are red

Q5) a) Write and explain with example pointer doubling algorithm in parallel computing. **[3]**

b) What is online algorithm? Discuss any online algorithm for paging. **[3]**

c) Write and explain closest pair problem with respect to randomized algorithm. **[4]**

Q6) a) Write the dual of following LP **[6]**

Maximize $40x_1 + 30\ x_2$

Such that $x_1 + x_2 <= 120$

$4x_1 + 2x_2 <= 320$

$x_1, x_2 >= 0$

Find the optimal solution of both primal and the dual.

b) Discuss various models for parallel computing. **[2]**

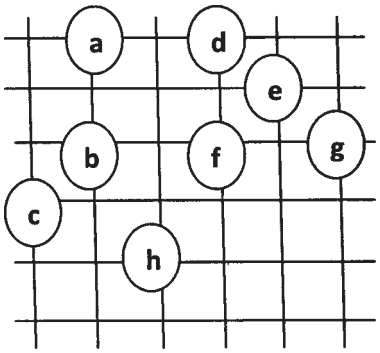
c) Reorder the following complexities from smallest to largest in each case **[2]**

i) $nlog(n), n + n^2 + n^3, 2^n\ sqrt(n)$

ii) $n^2, 2^n, nlog(n), log(n), n^3$

Q7) a) Prove that vertex cover problem is NP complete. **[5]**

b) **[5]**



Draw the complete undirected graph for the vertices shown in the figure. Vertices lie at the intersection of the grid lines. For example, vertex f is one unit to the right and two units up from vertex h. Draw the minimum spanning tree for the graph and then find the cost for travelling salesman using an approximation algorithm.

Q8) a) Construct the B-Tree of degree 2 with following keys.

5, 3, 21, 9, 1, 13, 2, 7, 10, 12, 4, 8 **[5]**

b) Delete following keys from the tree constructed in part a) and show the tree after each deletion.

Keys to be deleted: 2, 21, 10, 3, 4. **[5]**

EEE

Total No. of Questions : 8]

SEAT No. :

P4555

[Total No. of Pages : 2

[4860]-1354

M.E. (Information Technology)

ADVANCED OPERATING SYSTEMS

(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Answer any five (5) questions out of eight questions(8).***
2) ***Figures to the right hand indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) How does buddy system algorithm work on Linux? **[4]**

b) General Semaphore having value equal to 1 can be used for achieving mutual exclusion. Explain. **[3]**

c) Differentiate between program and process. **[3]**

Q2) a) Explain the user level thread creation mechanism in Windows OS. **[4]**

b) Explain the orphan and zombie states in UNIX. **[3]**

c) Is there a mechanism in which a thread locks mutex while entering the critical section and unlocks immediately because some condition is not satisfied? Explain with an example. **[3]**

Q3) a) What kind of thread implementation is supported in Linux? Explain with suitable example. **[5]**

b) Explain the hardware approach for implementing mutex. **[3]**

c) What is use pthread_join function? **[2]**

Q4) a) Explain 2-level page table organization with example. **[4]**

b) Explain any four features of UNIX's S5FS. **[4]**

c) What is the data structure used for storing the information about a file in Linux? **[2]**

P.T.O.

Q5) a) What is distributed operating system? **[2]**

b) Differentiate between Logical and physical clock synchronization in a distributed system. **[4]**

c) Explain any four design issues in designing the distributed operating system? **[4]**

Q6) a) Why do you mean by consistency? Explain Strict and Entry consistency models with example. **[5]**

b) What is the need for leader election? What are different approaches for finding the leader election in DOS? **[3]**

c) What is a message passing? What are the primitives available in message passing? **[2]**

Q7) a) What is load estimation? Explain different load estimation policies. **[5]**

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

Q8) a) Explain different design issues for implementing Distributed Shared Memory. **[5]**

b) How process addressing is done in message passing? **[5]**

Total No. of Questions :5]

SEAT No. :

P4375

[Total No. of Pages :2

[4860]-1355

M.E. (Information Technology)

RESEARCH METHODOLOGY

(2013 Credit Pattern) (Semester - I) (514404)

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) Describe the difference between random, systematic, stratified, cluster, and multistage sampling. **[5]**

b) List and explain various experimental designs. **[5]**

Q2) 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? **[5]**

b) Recommend an appropriate data collection method in the following situations. Provide justification for your choice: **[5]**

i) When topic is highly technical and specialized and complex.

ii) when population is illiterate.

iii) When topic is related to understanding attitude of college going students.

iv) When understanding buying behavior of shoppers in a mall.

Q3) a) Describe the importance of literature survey in scientific research. **[5]**

b) Distinguish between the following: **[5]**

i) One-tailed test and two-tailed test

ii) type I error and Type II error

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) What is a hypothesis? What characteristics it must possess in order to be a good research hypothesis? **[5]**

Q5) a) Write short notes on the following: **[5]**

i) Report writing is an art.

ii) Secondary data.

iii) Significance of sampling.

b) What do you understand by research report or thesis? Indicate its need and importance in the research work. Indicate the general format of research report. **[5]**

EEE

Total No. of Questions :8]

SEAT No. :

P4376

[Total No. of Pages :2

[4860]-1356

M.E. (Information Technology)

WIRELESS COMMUNICATION TECHNOLOGIES

(2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Assume suitable data, if necessary.***
2) ***Answer any 5 questions out of 8 questions.***
3) ***Figures to the right indicate full marks.***

Q1) a) Explain in detail ad-hoc On-Demand Distance Vector Routing Algorithm. **[5]**

b) Explain the DSR routing with its advantages and disadvantages. **[5]**

Q2) a) What is hard state receiver-initiated multicast protocol? Explain with suitable diagram. **[5]**

b) Describe the technical challenges in a PRNET. **[5]**

Q3) a) State and explain the distinct properties of wireless sensor network. **[5]**

b) What are the characteristics of an ideal routing protocol for ad-hoc wireless networks. **[5]**

Q4) a) Why does TCP not perform well in ad-hoc wireless networks? **[5]**

b) What are the characteristics of a wireless channel? **[5]**

Q5) a) Explain need for energy management in ad-hoc wireless networks. **[5]**

b) Why is a back-off timer used in the CSMA/CA mechanism? **[5]**

P.T.O.

Q6) a) Draw and explain the frame format for IEEE 802.11. **[5]**

b) Explain the reference Architecture of Multicast Routing Protocol. **[5]**

Q7) a) Discuss the QoS Framework: INSIGNIA for ad-hoc wireless network. **[5]**

b) How security-aware AODV protocol provides solution against black-hole attack? **[5]**

Q8) a) Explain the battery management protocol to increase the lifetime of the nodes by exploiting the recovery capacity effect of battery. **[5]**

b) Explain various energy management Issues in ad-hoc networks. **[5]**

EEE

Total No. of Questions :8]

SEAT No. :

P4377

[Total No. of Pages :2

[4860]-1357

M.E. (Information Technology)

ADVANCED DATABASE SYSTEMS

(2013 Credit Pattern) (Semester - II)

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) ***Figures to the right indicate full marks.***

Q1) a) Explain promises of DDBSs. **[3]**

b) Explain distributed DBMS architecture with neat diagram. **[5]**

c) What do you mean by Query decomposition? **[2]**

Q2) a) What is query processing? Explain layers of query processing. **[5]**

b) What do you mean by localization of distributed data. **[3]**

c) Explain allocation in detail with suitable example. **[2]**

Q3) a) Explain different concurrency control mechanisms. **[3]**

b) What is deadlock? Explain deadlock recovery algorithm in detail. **[5]**

c) Explain the term Serializability. **[2]**

Q4) a) Explain Time stamped concurrency control algorithm in detail. **[4]**

b) Discuss issues in failures under Distributed DBMS. **[3]**

c) Explain network partitioning in detail. **[3]**

P.T.O.

Q5) a) Explain parallel DBMS techniques in detail. **[4]**

b) Explain database series for parallel database systems. **[3]**

c) What are parallel databases? **[3]**

Q6) a) Discuss architectural issues under distributed object DBMS. **[5]**

b) Explain persistent programming language in detail. **[3]**

c) Discuss inheritance under object oriented data models. **[2]**

Q7) a) Explain DW architecture with suitable diagram. **[5]**

b) Discuss OODBMS and ORDBMS. **[5]**

Q8) a) Explain Preprocessing and classification under data mining in detail. **[5]**

b) Discuss KDD process w.r.t. knowledge discovery. **[5]**

EEE

Total No. of Questions : 8]

SEAT No. :

P4378

[Total No. of Pages : 2

[4860]-1358

M.E. (Information Technology)

ADVANCE COMPUTER ARCHITECTURE

(2013 Credit Pattern) (Semester - II) (514409)

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

Instructions to the candidates:

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

Q1) a) Explain in detail the types and levels of parallelism with neat diagram. **[4]**

b) Discuss the limitations of Instruction Level parallelism. **[2]**

c) Discuss the basic parallel Techniques for parallel processing. **[4]**

Q2) a) Write a note on Multiple Issue processors and their significance in Instruction level parallelism. **[4]**

b) Explain WAR and RAW data hazards in detail with appropriate example. **[2]**

c) Differentiate between data dependence and control dependence with example. **[4]**

Q3) a) Define Thread-Level Parallelism. How multithreading uses Thread-Level parallelism? **[4]**

b) Discuss the limitations on ILP for Realizable Processors. **[4]**

c) Explain Hardware based speculation. **[2]**

P.T.O.

Q4) a) Explain symmetric shared-memory architecture in detail. **[4]**

b) What is an Interconnection Network? Explain Buses and crossbar switches for Interconnection Networks. **[3]**

c) Discuss the various cache coherency issues. **[3]**

Q5) a) Explain simultaneous Multithreading in brief. **[4]**

b) Explain design issues in multi-core architecture. **[3]**

c) Write a note on IBM Cell Architecture. **[3]**

Q6) a) Discuss about the advanced optimizations of cache performance. **[4]**

b) Write a note on Virtual memory and virtual machines. **[4]**

c) What is memory technology? Explain SRAM technology. **[2]**

Q7) a) Explain design features of SIMD architecture. **[5]**

b) Write Notes on: **[5]**

i) Sequential Control flow model

ii) Dataflow Model

Q8) a) Explain Intel Core DUO architecture with neat block diagram. Address the different multi-core issues in this architecture. **[5]**

b) Explain Multi-Core system Organization and its issues. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4379

[Total No. of Pages : 2

[4860]-1359

M.E. (Information Technology)

INFORMATION ASSURANCE AND SECURITY

(2013 Credit Pattern) (Semester - III) (514413)

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) Define Confidentiality and Integrity. **[2]**

b) State and explain the critical components of Information security. **[4]**

c) Compare design and implementation phase of SDLC and secSDLC. **[4]**

Q2) a) Why is the top-down approach to information security superior to the bottom-up approach? **[3]**

b) Explain with example Law and Ethics. **[3]**

c) What is security? State the multiple layers of security to protect the information. **[4]**

Q3) a) Compare authentication and authorization. **[3]**

b) What is privacy in an information security context? **[3]**

c) State and explain various assets of the organization that require protection? **[4]**

P.T.O.

Q4) a) Write short note on Enterprise Information Security Policy (EISP) **[4]**

b) What is the difference between a denial-of-service attack and a distributed denial-of-service attack? Which is more dangerous? Why? **[4]**

c) What is shoulder surfing? **[2]**

Q5) a) Explain following key information security concept: Vulnerability, Threat agent, Exploit, and access. **[3]**

b) Define threat? State the categories of threats. **[3]**

c) Enlist features of Biometric Access Controls. **[4]**

Q6) a) State three types of security policies. **[2]**

b) What are the differences between a policy, a standard, and a practice? **[4]**

c) What methods does a social engineering hacker use to gain information about a user's login id and password? **[4]**

Q7) 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) Which types of data and techniques used for computer forensics. **[5]**

Q8) a) Define Cyber Crime and list at least six types of cyber crime. **[5]**

b) In risk management strategies, why must periodic review be a part of the process? **[5]**

Total No. of Questions : 7]

SEAT No. :

P4380

[Total No. of Pages : 2

[4860]-1360

M.E. (Information Technology)

NETWORK PROGRAMMING

(2013 Credit Pattern) (Semester - III) (514414)

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) Give the comparison of various socket address structures. **[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) Distinguish between concurrent and iterative server. **[5]**

Q3) a) Explain connect function of elementary TCP sockets with three way handshake. **[5]**

b) Write and explain gethostbyname function of DNS. **[5]**

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]**

P.T.O.

Q5) a) How ioctl function works in network programs? **[5]**

b) What are the problems with UDP sockets? **[5]**

Q6) a) Explain DNS with respect to network programs. **[5]**

b) Give the distinction between thread and fork with suitable examples. **[5]**

Q7) a) Give a detail note on functions form basic thread creation to termination. **[5]**

b) Write and explain Thread-specific Data. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4381

[Total No. of Pages : 2

[4860]-1361

M.E. (Instrumentation and Control) (Process & Biomedical Instrumentation)

MATHEMATICAL METHODS IN INSTRUMENTATION

(2013 Credit Pattern)(Semester -I) (506101)

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 linear combination of vectors with suitable example. **[2]**

b) Let B ={(1, 0, 0), (0, 1, 0), (0, 0, 1)}.

Show that B is the basis vector set in vector space $V=IR^3$ **[4]**

c) Find the norm of each vectors and distance between vectors (1,1,-1) and (-1, 1, 0). **[4]**

Q2) a) Obtain the orthogonal projections of the following vectors on X, Y and Z axis: u = (1,1,1), v=(2,2,2), w = (3,3,3), x = (4,4,4). **[4]**

b) Obtain orthonormal vectors from following vectors (use Gram schimmit Method). u = (1,-3), v = (2,2) **[4]**

c) Explain orthogonal and orthonormal vectors with suitable examples. **[2]**

Q3) a) Using Gauss Seidal iteration method, obtain the solutions of the followings: **[5]**

$$83x + 11y - 4z = 95;$$
$$7x + 52y + 13z = 104;$$
$$3x + 8y + 29z = 71.$$

b) Find the square root of 10 using Newton Raphson method. **[3]**

c) Discuss the role of Numerical methods in Biomedical Instrumentation. **[2]**

P.T.O.

Q4) a) Compute the first 4 central moments for the following process. **[6]**

No. of Jobs completed	0-10	10-20	20-30	30-40	40-50
No. of workers	6	26	47	15	6

b) Explain skewness and kurtosis with suitable examples. **[4]**

Q5) a) A Five figure no. is formed by the digits 0, 1, 2, 3, 4 (without repeatation). Find the probability that the no. Formed is divisible by 4. **[6]**

b) There are 6 married couples travelling in min-bus. If 2 persons are ask to get down from the bus, find the probability that:

i) They are of different sex.

ii) They are married to each other. **[4]**

Q6) a) The number of road accidents on Mumbai-pune express highway during a month follows poission distribution with mean 5. Find the probability that in certain month the number of accidents will be,

i) Less than 3

ii) Between 3 and 5. **[8]**

b) State probability axioms. **[2]**

Q7) a) Calculate the singular Value Decomposition of the matrix. **[5]**

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

b) Two dies are thrown simulteneously. Find the probability that the sum is exactly 9. **[5]**

Q8) a) Assume vectors a = [1,0,0,0], b = [1,0,0,0], c =[1,0,0,0], d =[1,0,0,0].

Let B = {a,b,c,d}.

Prove that the B is the basis for $V = IR^4$ **[5]**

b) Explain Bayes's theorem with suitable example. **[5]**

Total No. of Questions : 5]

SEAT No. :

P4382

[Total No. of Pages : 2

[4860]-1362

M.E. Instrumentation & Control (Process Instrumentation)

TRANSDUCER DESIGN

(2013 Credit Pattern) (Semester - I) (506102)

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 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 classification of transducers in detail. **[5]**

b) Explain piezoelectric sensor with its applications. **[5]**

c) Design a temperature indicator by using thermocouple with cold Junction compensation. **[5]**

Q2) Attempt any two of the following.

a) Design electromechanical type level indicator used for measurement of water level in the tank. **[5]**

b) Discuss proximity sensor and its signal conditioning circuits. **[5]**

c) Explain design of electromagetic flowmeter with neat sketch. **[5]**

Q3) Attempt any two of the following.

a) Explain different circuits required for design of LVDT. Also give each circuit important. **[5]**

b) With neat sketch explain torsion bar sensor for measurement of shaft power. **[5]**

c) Give classification of chemical sensors. Explain any two in detail. **[5]**

P.T.O.

Q4) Attempt any two of the following.

a) Explain two different modes of ultrasonic flowmeter. **[5]**

b) Write note on nano sensors and its applications. **[5]**

c) Explain manufacturing process of MEMS with neat sketch. **[5]**

Q5) Attempt any two of the following.

a) Explain two applications of Biosensor. **[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 : 8]

SEAT No. :

P4383

[Total No. of Pages : 2

[4860]-1363

M.E. Instrumentation & Control (Process Instrumentation)

INDUSTRIAL AUTOMATION

(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 side 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 in brief commissioning of HART. **[5]**

Q2) a) Explain the function of Safety Life cycle. **[5]**

b) Develop programmable ladder diagram for Stirred tank heater. (Assume suitable Sequence) **[5]**

Q3) a) Explain with example HaZop. **[5]**

b) List different types of Field bus. State advantages of Profibus. **[5]**

Q4) a) What is OPC? Explain with suitable example. **[5]**

b) Explain with an example 'Sequential Function Chart'. **[5]**

Q5) a) Draw and explain famous automation hierarchy for an industrial application. **[5]**

b) Explain working principle of HART protocol in detail. **[5]**

P.T.O.

Q6) a) Explain steps for interfacing PLC to SCADA. **[5]**

b) Discuss the various selection criteria that must be considered for selection of a suitable PLC for a specific process control. **[5]**

Q7) a) Explain in brief different types of Sequencer? **[5]**

b) Describe the data flow and number conversions involved in PLC analog operation. **[5]**

Q8) a) Elaborate with suitable example SCADA system. **[5]**

b) There are three mixing devices on a processing line: A, B and C. After the process begins A is to be started after 10 seconds elapse. Next, mixer B is to start 7 seconds after A. Mixer C is to start 4 seconds after B. All then remain on for 20 seconds. After then product is to be removed through drain valve. This sequence is to be repeated for 2 times and then the process is halted. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4384

[Total No. of Pages : 2

[4860] - 1364

M.E. (Instrumentation & Control) (Process & Biomedical)

RESEARCH METHODOLOGY

(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

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

Q1) a) What is the necessity of defining a research problem? Explain. **[5]**

b) Define and bring out exact differences among **[5]**

i) Descriptive and Analytical research.

ii) Applied and Fundamental research.

Q2) a) Comment on Fidelity of Instruments. **[5]**

b) What are dynamic characteristics of instruments used in experimental setup? **[5]**

Q3) a) Discuss interview as a technique of data collection. **[5]**

b) Define research. What are the various steps involved in a research process? **[5]**

Q4) a) Explain the difference between R^2 and adjusted R^2. **[5]**

b) Discuss in brief Principal component analysis. **[5]**

P.T.O.

Q5) a) Discuss in brief Uncertainty Analysis. **[5]**

b) What do you understand by Multivariate techniques? **[5]**

Q6) a) How to estimate parameters? What are different methods for analyzing these parameters. **[5]**

b) What are the guiding considerations in the construction of questionnaire? Explain. **[5]**

Q7) a) Which research is more significant for business making and how? **[5]**

b) What do you mean by 'lines of regression'? Explain. **[5]**

Q8) a) Explain the significance of a research report and narrate various steps involved in writing such a report. **[5]**

b) What is the relevance of Setting objectives in research. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P4385

[Total No. of Pages : 2

[4860] - 1365

M.E. (Instrumentation & Control) (Process Instrumentation)
ADVANCED PROCESS CONTROL
(2013 Credit Pattern) (Semester - II)

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

Instructions to the candidates:

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

Q1) a) What is the need of modeling? Explain in brief different types of model. **[5]**

b) Discuss with suitable example Control Objectives and their benefits. **[5]**

Q2) a) Two liquid ingredients A & B are to be blended in the proportion of 1:2. Draw control Loop schematics to indicate the two ways in which this task can be achieved. **[5]**

b) Describe with neat sketch selective control. **[5]**

Q3) a) Consider a liquid level control system with F1 as inlet flow rate from process 1 to tank and F2 as outlet flow rate to process 2. Develop feedback control strategy for **[5]**

i) F1 is regulated by process 1

ii) F2 is regulated by process 2

b) Explain design procedure of IMC for Second Order Process with RHP zero. **[5]**

P.T.O.

Q4) a) Describe with suitable application Feedback+Feedforward controller. **[5]**

b) Describe with suitable application cascade controller. **[5]**

Q5) a) Explain design procedure of MRAS using MIT rule. **[5]**

b) What is Model Predictive Controller? Explain with suitable block diagram. **[5]**

Q6) a) Describe the process reaction curve method for identifying dynamic models. **[5]**

b) Explain in brief self tuning regulator. **[5]**

Q7) a) What is DMC? Explain its importance in process control. **[5]**

b) Develop mathematical model of surge tank from first principle. **[5]**

Q8) a) Consider a system described by $G(s)=\frac{b}{(s^2+a)}$' where a & b are unknown parameters. Find Simple control law that can control the plant well, and derive an adaptive algorithm that gives good performance. **[5]**

b) Discuss in brief MRAC using Lyapnov theory and design controller for first order system. **[5]**

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Total No. of Questions : 5]

SEAT No. :

P4386

[Total No. of Pages : 2

[4860] - 1366

M.E. (Instrumentation) (Process Instrumentation)

EMBEDDED SYSTEM DESIGN

(2013 Credit 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) ***Figure 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 8-bit Timer/Counter 0 prescaler of AT8535 AVR microcontroller. **[5]**

b) Explain with suitable block diagram reset sources of ATMega8535 AVR µC. **[5]**

c) Draw and explain dual channel voltmeter using AVR microcontroller. **[5]**

Q2) Attempt any two of the following.

a) Explain memory organization of ARM processor. **[5]**

b) Discuss the Registers used in the ARM THUMB instruction set. **[5]**

c) Explain different modes of operation of ARM processor along with its advantages and disadvantages. **[5]**

Q3) Attempt any two of the following.

a) Explain how multiple processors can be connected on Rs - 485 bus. **[5]**

b) Explain with neat schematic PC Parallel Port. **[5]**

c) Compare between SPI vs. I^2C. **[5]**

P.T.O.

Q4) Attempt any two of the following.

a) Explain standard CAN architecture. **[5]**

b) Describe the features of USB. **[5]**

c) Describe the four primary benefits of CAN protocol provides. **[5]**

Q5) Attempt any two of the following.

a) Explain in brief about FPGA based system design. **[5]**

b) Explain traditional FPGA design flow. **[5]**

c) What is the Difference between a FPGA and an ASIC? **[5]**

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Total No. of Questions : 5]

SEAT No. :

P4387

[Total No. of Pages : 2

[4860] - 1367

M.E. (Instrumentation & Control) (Process Instrumentation)
ADVANCED CONTROL SYSTEM
(2013 Credit Pattern) (Semester - II) (506109)

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 electronic pocket Calculator.***
5) ***Assume Suitable data if necessary.***

Q1) Attempt any two of the following.

a) Discuss difference between linear and nonlinear system. **[5]**

b) Explain relay function with its mathematical representation. **[5]**

c) Define singular point. Also explain natures of singular points with neat diagrams. **[5]**

Q2) Attempt any two of the following.

a) Define describing function? Find describing function for saturation. **[5]**

b) Explain describing function analysis of non-linear system with necessary diagram. **[5]**

c) Explain method for finding limit cycles of nonlinear system using describing function with necessary diagrams. **[5]**

Q3) Attempt any two of the following.

a) Explain stability analysis of nonlinear systems. **[5]**

b) Show that following quadratic form is positive definite. **[5]**

$$V(x) = 10x_1^2 + x_2^2 + 6x_3^2 + 2x_1x_2 - 4x_1x_3 - 1x_2x_3$$

P.T.O.

c) Determine the stability of a non-linear system governed by equation **[5]**

$$\dot{x}_1 = -x_1 + 10x_1^2 x_2$$

$$\dot{x}_2 = -x_2$$

Q4) Attempt any two of the following.

a) Write short note on feedback linearization. **[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) Discuss design steps of sliding mode control using linear sliding surface. Also draw its approximate 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]**

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Total No. of Questions : 5]

SEAT No. :

P4388

[Total No. of Pages : 2

[4860]-1368

M.E. (Instrumentation & Control (Process Instrumentation)

ADVANCED SIGNAL PROCESSINGS

(2013 Credit Pattern) (Semester - III) (606101)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) Solve any two:

a) Explain need of time frequency analysis. **[5]**

b) Compute DFT of sequence, $x(n) = \cos(n\pi); 0 \le n \le 3$ **[5]**

c) Compare DIT and DIF FFT algorithm. **[5]**

Q2) Solve any two.

a) Explain adaptive noise cancelling system with respect to adaptive filters. **[5]**

b) Compare RLS and LMS algorithms. **[5]**

c) Explain noble identities in Multirate signal processings. **[5]**

Q3) Solve any two.

a) Explain how different digital systems are interfaced using multirate sampling process. **[5]**

b) Explain Q factor filtering. **[5]**

c) Write short note on wavelet packets. **[5]**

P.T.O.

Q4) Solve any two:

a) Explain delay chain perfect reconstruction systems. **[5]**

b) Write short note on multiresolution Analysis. **[5]**

c) Explain the terms transform coding and LOT. **[5]**

Q5) Solve any two:

a) Compare performance characteristics of Nonparametric power spectrum estimation methods. **[5]**

b) Explain forward linear prediction using different filters. **[5]**

c) Explain AR, MA, ARMA processes. **[5]**

Total No. of Questions : 7]

SEAT No. :

P4389

[Total No. of Pages : 2

[4860]-1369

M.E. (Process Instrumentation & Control)

BUILDING AUTOMATION

(Semester - III) (2013 Credit Pattern) (606102)

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 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) Explain with neat sketch building life safety system. **[6]**

b) Write a short notes on Central processing unit of FACP. **[4]**

Q2) a) List various types of reader in biometric access control system, Explain authentication with example. **[6]**

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

Q3) a) Explain single duct, constant volume, single zone systems Air conditioning system with neat sketch. **[6]**

b) Write a short notes on Air Handling Unit (AHU) **[4]**

Q4) a) What is Vapour compression cycle? Explain any one type of evaporator used in vapour compression cycle. **[6]**

b) Write a short notes on Chilled water coil. **[4]**

P.T.O.

Q5) a) Explain features of primary controller and secondary controller in DDC with neat sketch. **[6]**

b) Write short notes on green building. **[4]**

Q6) a) Explain different steps in DDC control design process. **[6]**

b) Write a short notes on BACnet protocol. **[4]**

Q7) a) Explain project management, what are the charactertics of project. **[6]**

b) Write a short note on project closure & signoff. **[4]**

Total No. of Questions : 8]

SEAT No. :

P4390

[Total No. of Pages : 2

[4860]-1371

M.E. (Instru. & Control)(Biomedical Instrumentation)

BIO-SIGNAL PROCESSING

(2013 Credit Pattern) (Semester-I)

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

Instructions to the candidates:

1) ***Attempt any 5 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) Find the even and odd parts of the function, $x(n) = A\sin(n\omega)$. **[4]**

b) Determine whether following analog signals are periodic or not. If periodic, find its fundamental period: **[6]**

i) $x(t) = 2\sin\left(\frac{2}{3}t\right) + 4\cos\left(\frac{1}{2}t\right) + 5\cos\left(\frac{1}{3}t\right)$.

ii) $x(t) = \cos\left(\sqrt{2}t\right) + \sin(t/4)$.

Q2) a) Determine impulse response of the system described by: **[4]**

$$y(n) + 2y(n-1) + y(n-2) = x(n)$$

b) Determine the unit-step response of the above system. **[4]**

c) Sketch the output in (*a*) and (*b*). **[2]**

Q3) Explain the following properties of systems: **[10]**

a) Linearity

b) Causality

c) Time variance

P.T.O.

Q4) Use following methods to obtain digital lowpass filter to approximate

$$H(s)=\frac{1}{s^2+\sqrt{2}s+1}:$$ **[10]**

a) Impulse invariance method

b) Bilinear transformation.

Q5) Compute and sketch the magnitude and phase response (DTFT) of the sequence $x(n) = \{0, 1, 2, 3\}$. **[10]**

Use $\omega=0,\frac{\pi}{4},\frac{\pi}{2},\frac{3\pi}{4},\pi,\frac{5\pi}{4},\frac{3\pi}{2},\frac{7\pi}{4},2\pi$.

Q6) Consider the sequences, $x_1(n) = \{1,2,3,4\}$, $x_2(n) = \{2,1,2,1\}$.

a) Compute DFT $X_1(k)$ using DIT FFT algorithm. **[3]**

b) Compute DFT $X_2(k)$ using DIT FFT algorithm. **[3]**

c) Determine $x_3(n)$ such that $X_3(k) = X_1(k)\, X_2(k)$. **[4]**

Q7) Design an FIR linear -phase digital filter with desired frequency response,

$$H_d(\omega)=\begin{cases} e^{-j5\omega}, & \text{for } |\omega|\le\frac{\pi}{5} \\ 0, & \text{for } \frac{\pi}{5}<|\omega|\le\pi \end{cases}$$

a) Determine the desired impulse response. **[3]**

b) Determine the filter coefficients h (n) using Triangular window function. **[3]**

c) Realize the above filter with direct -form structure. **[4]**

Q8) Design a digital lowpass filter using Butterworth approximation and bilinear transformation to meet following specifications.

Passband edge = 120 Hz

Stopband edge = 170 Hz

Stopband attenuation = 16 dB

Assume sampling frequency of 512 Hz. **[10]**

Total No. of Questions : 8]

SEAT No. :

P4391

[Total No. of Pages : 2

[4860]-1372

M.E. (Instrumentation & Control) (Biomedical Instrumentation)

ANALYTICAL INSTRUMENTATION

(2013 Credit Pattern) (Semester-I)

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

Instructions to the candidates:

1) ***Attempt any 5 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) What are the advantages and disadvantages of instrumental method over classical method? Explain potentiometric based analytical method of chemical analysis with the help of suitable diagram. **[10]**

Q2) What are the laws of photometry? State and derive a mathematical expression to combine each of the laws and their deviations. **[10]**

Q3) Explain the working principle of atomic absorption spectrometry (AAS) with the help of its block diagram and explain function of each component. Also, discuss instrumentation required in AAS. **[10]**

Q4) Explain the principle and working of FTIR spectrophotometer with the help of suitable block diagram. **[10]**

Q5) Write short notes on (any two): **[10]**

a) Discharge type atomiser

b) Inductively coupled plasma source

c) Integral burner used in flame photometer.

P.T.O.

Q6) Explain various factors affecting separation in Gas Chromatography. Also, explain various types of detectors used in it. **[10]**

Q7) State and prove Braggs law of X-ray diffraction. Explain electron microscope with the help of neat diagram. **[10]**

Q8) Explain following terms related to NMR spectroscopy: **[10]**

a) Nuclear spin and the splitting of energy levels in a magnetic field

b) Absorption of radiation by a nucleus in a magnetic field

c) Chemical shift

d) Spin-spin coupling

Total No. of Questions : 5]

SEAT No. :

P4392

[Total No. of Pages : 2

[4860]-1374

M.E. (Instrumentation & Control) (Biomedical Instrumentation)

TRANSDUCER DESIGN

(2013 Credit Pattern) (Semester - II) (506207)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wheneve necessary.***
3) ***Figure 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) Write note on sensors and its applications in measurement of biomedical parameters. **[5]**

b) What is pH? Explain how it can be detected in detail. **[5]**

c) Give any two techniques used for detection of radioactive radiations. **[5]**

Q2) Attempt any two of the following:

a) In detail explain different signal conditioning circuits used in weight indicator. Also give each circuit's importance. **[5]**

b) Discuss signal conditioning circuit of thermister for temperature measurement with zero and span adjustments. **[5]**

c) Explain design of capacitive sensor for displacement measurement. **[5]**

Q3) Attempt any two of the following.

a) Explain any one transducer for torque measurement with its signal conditioning circuits. **[5]**

b) List different types of force transducers and discuss any one in detail. **[5]**

c) Explain industrial applications of nano sensors. **[5]**

P.T.O.

Q4) Attempt any two of the following.

a) Give selection criteria for ultrasonic flowmeter. Also explain its two methods for flow measurement. **[5]**

b) List gas sensors and explain its anyone biomedical example in detail. **[5]**

c) Explain manufacturing process of MEMS with neat sketch. **[5]**

Q5) Attempt any two of the following.

a) Explain biosensors and give its classification. **[5]**

b) List different chemical sensors and explain any two in detail. **[5]**

c) Explain LASER application in printing operations. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4393

[Total No. of Pages : 2

[4860]-1375

M.E. (Instrumentation and Control) (Biomedical Instrumentation)

DIGITAL IMAGE PROCESSING

(2013 Credit Pattern) (506208) (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 side indicate full marks.***

Q1) a) Describe the fundamental stages of digital image processing system. **[4]**

b) Explain specifications of digital camera. **[3]**

c) Explain spatial and intensity resolution with suitable examples. **[3]**

Q2) a) Explain Histogram with suitable example. **[2]**

b) Explain grey level image tranasformations. **[4]**

c) Explain the role of distance measures. **[4]**

Q3) a) Define 2D DFT and explain its properties. **[5]**

b) Explain Image enhancement in spatial domain. **[5]**

Q4) a) Explain laplacian filter for image enhancement. **[5]**

b) Compare image smoothing and image sharpening. **[5]**

Q5) a) Explain image restoration with suitable application. **[5]**

b) Describe how periodic noise is removed in frequency domain. **[5]**

P.T.O.

Q6) a) Explain image representations. **[5]**

b) Compare various edge detection operators. **[5]**

Q7) a) Compare time domain and frequency domain image enhancement. **[5]**

b) Explain Rodert operators for edge detection. **[5]**

Q8) a) Explain 2D DCT. **[5]**

b) Discuss the need of image compression with suitable example. **[5]**

Total No. of Questions : 8] **SEAT No. :**

P4556 **[Total No. of Pages : 2**

[4860]-1376

M.E. Biomedical (Instrumentation & Control)

COMMUNICATION PROTOCOLS FOR INSTRUMENTATION

(2013 Pattern)

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

Instructions to the candidates:

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

Q1) a) Explain the redundancy and failure considerations in Fieldbus. **[5]**

b) List and explain any three Universal HART commands. **[3]**

c) Explain Synchronous Communication with neat waveform. **[2]**

Q2) a) With a neat diagram, explain the mapping of variants of Profibus on the OSI layer. **[4]**

b) How does redundancy handle failure of physical medium in Fieldbus? **[4]**

c) Explain any two building blocks of networks. **[2]**

Q3) a) Explain the Frequency Hopping Spread Spectrum in Bluetooth Protocol. **[4]**

b) Compare MODBUS and MODBUS plus protocols. **[4]**

c) Explain the token passing method used for bus arbitration. **[2]**

Q4) a) Write a short note on Zigbee protocol. **[5]**

b) Elaborate the use of Function block library in Foundation Fieldbus Network. **[3]**

c) Explain any two applications of Bluetooth protocol. **[2]**

P.T.O.

Q5) a) What does the field of 'Device address' and 'Function code' represent in the query of MODBUS? **[4]**

b) Explain the applications of Wi Fi **[4]**

c) List any four features of RS 485. **[2]**

Q6) a) With neat diagram, explain the hybrid media access regulating method in Profibus DP. **[4]**

b) List any four technical specifications of Data Highway Plus. **[4]**

c) What is a data frame in communication? List any two fields used in a frame. **[2]**

Q7) a) Elaborate with neat sketches, any one Industry application explaining the Cost-saving advantage of HART communication protocol. **[5]**

b) With neat sketches, explain the physical layer of Foundation Fieldbus H1. **[5]**

Q8) Write short notes :

a) Link Active Scheduler. **[5]**

b) Advantages and Limitations of Open Networks. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4394

[Total No. of Pages : 2

[4860]-1377

M.E. (Biomedical Instrumentation)

MEDICAL IMAGING TECHNIQUES

(2013 Credit Pattern) (Semester-III) (606201)

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

Instructions to the candidates:

1) ***Answer any five questions from paper.***
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 electromagnetic spectrum and explain its different ranges. **[5]**

b) Why we should use different imaging techniques? **[3]**

c) Draw the beam profile for ultrasound wave used in imaging. **[2]**

Q2) a) Which three factors affect observers ability to detect abnormality. **[4]**

b) Draw and explain Xray emission spectrum for tungsten. **[4]**

c) Explain the need of Automatic Exposure Control using phototimers in mammography. **[2]**

Q3) a) Draw block diagram of Xray tube and explain it in detail. **[5]**

b) With the help of graphs, explain the effect of mA and kVp on quality and quantity of Xrays. **[5]**

Q4) a) Define Optical Density. Elaborate the concept for radioopaque and radioluscent material. **[4]**

b) Why the breasts are compressed during mammography? **[4]**

c) What is selective filtration? How it is achieved? **[2]**

P.T.O.

Q5) a) Explain the principle of computed tomography with the help of a neat diagram. **[4]**

b) How the computed Tomography system is tested and calibrated? **[4]**

c) What is used as the contrast medium in Ultrasound imaging. **[2]**

Q6) a) Write a shortnote on Magnetic Resonance Imaging. **[5]**

b) Explain B mode of Ultrasound and any one application of it. **[5]**

Q7) a) What is Mechanical Matching? How it is implemented for ultrasound transducers? **[4]**

b) What are the detectors used in nuclear medicine. **[4]**

c) How the speed of ultrasound varies with different body structures? **[2]**

Q8) a) Describe the functioning of Gamma camera with the help of a neat diagram. **[5]**

b) What is annihilation process? **[3]**

c) Describe the principle of Thermography. **[2]**

Total No. of Questions : 8]

SEAT No. :

P4395

[Total No. of Pages : 2

[4860]-1378

M.E. (Instrumentation and Control) (Biomedical Instrumentation)

ADVANCED DIGITAL SIGNAL PROCESSING

(2013 Credit Pattern) (606202) (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) ***Assume suitable data, if necessary.***

Q1) a) Explain optimal window selection for S.T.F.T. analysis with example **[4]**

b) Explain properties of Wigner ville Distribution. **[2]**

c) State applications of TFD analysis. Explain any one. **[4]**

Q2) a) Explain Decimation in frequency domain. **[5]**

b) Explain the application of multirate signal processing. **[5]**

Q3) a) Define ESD and PSD. **[2]**

b) Explain Barttlet method of PSD estimation. **[4]**

c) Discuss the need of parametric PSD estimation. Explain any one method. **[4]**

Q4) a) State applications of adaptive filetring. Explain any one. **[5]**

b) Explain RLS algorithm with suitable diagram. **[5]**

Q5) a) Explain how random signals are generated using models. **[4]**

b) Explain the behaviour of linear systems with random signals. **[4]**

c) Define SSS and WSS. **[2]**

P.T.O.

Q6) a) What is the need of digital data compression standards. **[2]**

b) Compare lossy and lossless image compression standards. **[4]**

c) Explain JPEG standard of image compression. **[4]**

Q7) a) Explain interpolation by rational factor. **[5]**

b) Explain convolution using homomorphic signal processing. **[5]**

Q8) a) Compare parametric and non parametric methods of PSD estimation. **[5]**

b) Obtain the two polyphase components of the filter $H(z) = 1 + 2z^{-1} + 3z^{-2} + 4z^{-3}$ and draw the efficient structure. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4396

[Total No. of Pages : 3

[4860]-1379

M.E. (Polymer)

MATHEMATICAL AND STATISTICAL METHODS

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

Q1) a) Solve the following system of equations, using Gauss-Seidel method: **[5]**

$$27x_1 + 6x_2 - x_3 = 85$$
$$6x_1 + 15x_2 + 2x_3 = 72$$
$$x_1 + x_2 + 54x_3 = 110$$

b) Use power method to determine the largest eigen value and the corresponding eigen vector of the following matrix A. **[5]**

$$A = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix}$$

Choose initial vector $\bar{X} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

Q2) a) Find z- transforms of the following (any two): **[6]**

i) $e^{-3k}\cos 4k,\ k \geq 0$

ii) $4^k + 5^k,\ \ k \geq 0$

iii) $\dfrac{2^k}{k},\ \ k \geq 1$

P.T.O.

b) Find inverse z - transform of the following (any one): **[4]**

i) $\dfrac{z}{\left(z-\frac{1}{4}\right)\left(z-\frac{1}{5}\right)}, \ |z|>\dfrac{1}{4}$

ii) $\dfrac{z^2}{z^2+1}$ using inversion integral method.

Q3) a) Solve the difference equation: **[5]**

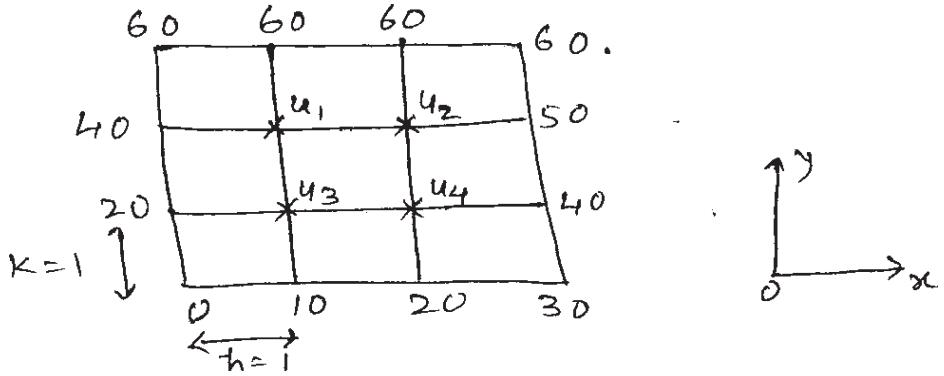
$$f(k+1)+\frac{1}{2}f(k)=\left(\frac{1}{2}\right)^k, k\geq 0, f(0)=0$$

b) Evaluate $\int_0^1 \dfrac{1}{x+2}\,dx$ using Gauss -Quadrature three point formula. **[5]**

Q4) a) Use Runge-Kutta fourth order method to find y at $x = 0.2$.

Given $\dfrac{dy}{dx}=xy+y^2,\ y(0)=1, h=0.1.$ **[5]**

b) Given the values of $u(x, y)$ on the boundary of the square given below. Evaluate the function $u(x, y)$ at nodal points 1, 2, 3 and 4 where $u(x, y)$ satisfies the equation $\dfrac{\partial^2 u}{\partial x^2}+\dfrac{\partial^2 u}{\partial y^2}=0, h=k=1.$ **[5]**



Q5) a) Solve the boundary value problem using finite difference technique.

$y''=x+y,\ y(0)=1,\ y(1)=1$ taking step size h = 0.2. **[5]**

b) Explain explicit finite difference method to solve one dimensional heat flow equation. Discuss the stability of the method. **[5]**

Q6) a) Find the extremal of the following functional $\int_{x_1}^{x_2} y\sqrt{1+y'^2}\,dx$ **[5]**

b) Use Galerkin's method to solve **[5]**

$y'' - y + x = 0 \ (0 \le x \le 1), y(0) = y(1) = 0$

Q7) a) Reduce the following matrix into tridiagonal form using Householder's method: **[5]**

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

b) Solve the following system of equations using LU decomposition method: **[5]**

$2x_1 + 3x_2 + x_3 = 9$

$x_1 + 2x_2 + 3x_3 = 6$

$3x_1 + x_2 + 2x_3 = 8$

Q8) a) In experiment on pea breeding, the following frequencies of seeds were obtained: **[5]**

Round and Green	Wrinkled and Green	Round and Yellow	Wrinkled and yellow	Total
222	120	32	150	524

Theory predicts that the frequencies should be in proportion 8:2: 2:1. Examine the correspondence between theory and experiment. Given $\chi^2_{3:0.05} = 7.815$

b) The nine items of a sample had the following values:

45, 47, 50, 52, 48, 47, 49, 53, 51.

Does the mean of the nine items differ significantly from the assumed mean 47.5? Use t-distribution, given t for 8 d.f. at 5% level significance = 2.31. **[5]**

Total No. of Questions : 8] SEAT No. :

P4646 [Total No. of Pages : 3

[4860] - 1380
M.E. (Polymer Engineering) (Semester - I)
PRINCIPLES OF MANAGEMENT
(2013 Pattern)

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

Instructions to the candidates:

1) ***Solve any 5 questions from total 8 question.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
3) ***Assume Suitable data if necessary.***

Q1) a) Discuss product differentiation and market segmentation. **[4]**

b) Write short note on return on investment. **[3]**

c) Discuss marginal costing in detail. **[3]**

Q2) a) State various forms of organizations. Briefly explain them. **[6]**

b) A finance company promises to pay lumpsum of Rs. 8,000 at the end of 6 years to investors who deposit annually Rs. 1,000 for 6 years. What is the implicit rate of interest? **[4]**

Q3) a) Comment on the importance of plant layout. **[3]**

b) Elaborate various factors governing plant location. **[4]**

c) What do you understand by profit and loss account? **[3]**

Q4) a) A company purchase the machine and it was decided to charge depreciation at 10% using reducing balance method. The written down value of machine was Rs. 59049 at the end of 5 years. Find orginal cost of the machine. What would be it written down value after 8 years? **[5]**

P.T.O.

b) Information related to the first half of the year ending is given below. **[5]**

Fixed expenses = Rs. 1,00,000

Sales value = Rs. 3,00,000

Profit = Rs. 50,000

During the second half of year company has projected loss of Rs. 10,000. Calculate,

i) P/v ratio, break-even point and margin of safety of 6 months ending

ii) The break-even point and margin of safety for the whole year.

Q5) a) Draw the network and, find critical path as well as project duration for the project data given in following table. find also total float. **[5]**

Activity	Duration in days	Activity	Duration in days
10-20	9	20-70	0
10-30	4	30-60	10
10-40	7	40-80	8
10-50	8	50-70	6
20-50	7	60-80	10

b) Briefly discuss various strategies of pricing. **[5]**

Q6) a) Solve following transportation problem. **[5]**

	Destination				
	A	B	C	D	
Source	21	16	25	13	11 Availability
	17	18	14	23	13
	32	27	18	41	19
Requirement	6	10	12	15	43

b) The processing time for machines, A and B, is given as follows. Calcualte optimal sequence, total elapsed time and idle time for each machine under the given condition that all the seven jobs must go through two machines.**[5]**

Job/Time (hrs)	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

Q7) a) Give at least three methods of calculation of depreciation. **[6]**

b) Discuss importance of advertisement, labelling and packaging in marketing. **[4]**

Q8) a) Discuss the concept of standard time and also elaborate on various allowances in time study. **[5]**

b) Write short note on fixed and working capital. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4557

[Total No. of Pages : 2

[4860]-1381

M.E. (Polymer Engineering)

ADVANCED POLYMER TECHNOLOGY

(2013 Credit 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 logarithmic tables, slide rule, electronic pocket calculator is allowed.***

Q1) a) Discuss in detail Flory-Huggins theory of polymer dissolution. **[4]**

b) Comment on the relevance of doping process in conductive polymers. **[3]**

c) Briefly explain various stages of obtaining polymer solution. **[3]**

Q2) a) Write short note on thermo-responsive polymers. **[4]**

b) Discuss in detail ring opening metathesis polymerization. **[4]**

c) Explain in brief principle of ionic polymerization. **[2]**

Q3) a) Explain the concept of piezoelectricity. Enumerate piezoelectric polymers. **[3]**

b) Differentiate between solid, fluid and liquid crystalline phases. **[3]**

c) Enlist various biopolymers. Explain any one in brief. **[4]**

Q4) a) With examples explain intrinsically and extrinsically conducting polymers? **[3]**

b) Comment on the molecular requirements for polymer to function as liquid crystalline polymer. **[4]**

c) Explain in brief concept of dendrimers. **[3]**

P.T.O.

Q5) a) Write short note on phase transfer polymerization technique. **[4]**

b) Explain the concept of glass transition and crystalline melting temperatures. **[4]**

c) Explain in detail graft copolymerization. **[2]**

Q6) a) What are photo responsive polymers? **[2]**

b) Explain the concept of positive and negative photoresists. **[4]**

c) Write short note on fluoroelastomers. **[4]**

Q7) a) Briefly discuss about polyurethane rubbers. **[5]**

b) State and briefly explain various routes to achieve comb and graft architectures. **[5]**

Q8) a) Discuss about application areas in which supramolecular chemistry and molecular self-assembly processes are used. **[5]**

b) Discuss various non-covalent supramolecular interactions. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4558

[Total No. of Pages : 4

[4860]-1382

M.E. (Polymer Engineering)

RESEARCH METHODOLOGY

(2013 Credit 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 logarithmic tables, slide rule, electronic pocket calculator is allowed.***

Q1) a) A botanist studies the flowering of five types of rose plants in a given field plot. The yield (in kg) over a period of time in the flowering season is given in the following table. Carry out ANOVA and draw a suitable inference from the data given (5% significance $F_{0.05}$= 3.26). **[7]**

II 140	V 130	II 184	I 162	IV 142
V 135	IV 134	II 120	III 191	I 132
III 160	I 140	IV 187	II 184	V 119
I 131	III 175	V 135	IV 126	II 122
IV 132	II 110	I 144	V 135	III 138

b) A weight loss product claims to reduce the weight of their customers by 25 kg (mean), with a standard deviation of 5 kg. Six customers were selected randomly and they weight loss was found to be 24, 26, 30, 20, 20, 18. Can you regard the claim to be valid at 1% significance using t-test (Data: $t_{0.01}$ = 4.032). **[3]**

P.T.O.

Q2) a) Explain the followings : Objectives of research, Types of research and Various steps in research process. **[6]**

b) In a particular local train at 11 am in Mumbai, the number of the people travelling varies day to day. The sample study gives the following observations. **[4]**

Days	Mon	Tue	Wed	Thu	Fri	Sat
No. of passengers	1115	1110	1126	1120	1124	1125

Test the hypothesis using χ^2 that the number of passengers do not depend on the day. (given 5% significance, χ^2 0.05 = 11.07)

Q3) a) Represent the following data by a histogram. **[3]**

Marks	No. of students	Marks	No. of students
0-10	4	50-60	15
10-20	8	60-70	12
20-30	10	70-80	9
30-40	18	80-90	6
40-50	26	90-100	3

b) Calculate median from the following data using continuous series. **[5]**

Marks	No. of students	Marks	No. of students
Less than 5	29	Less than 30	644
Less than 10	224	Less than 35	650
Less than 15	465	Less than 40	653
Less than 20	582	Less than 45	655
Less than 25	634		

c) Represent the following data with pie diagram of different types of groups of people and their percentage in a certain village. **[2]**

Group	Men	Women	Kids	Teenagers	Elderly
Percentage	19	16	18	12	35

Q4) a) How would you calculate the regression equation of Y on X and the value of r from the following observations of marks obtained by students in Subject A and Subject B. **[7]**

		Marks in subject A					
	Y ↓	X →	5-15	15-25	25-35	35-45	Total
		d_y ↓ d_x →	-1	0	1	2	
Marks in Subject B	0-10	-2	1	1	-	-	2
	10-20	-1	3	6	5	1	15
	20-30	0	1	8	9	2	20
	30-40	1	-	3	9	3	15
	40-50	2	-	-	4	4	8
	Total		5	18	27	10	60

b) Given that b_{xy}=0.45 and b_{yx}=0.67, with standard deviation $\sigma x = 6$, find the value of 'r' and σy. **[3]**

Q5) a) Find coefficient of correlation for the following by Karl Pearson method. **[6]**

Cost (X)	39	65	62	90	82	75	25	98	36	78
Sales (Y)	47	53	58	86	62	68	60	91	51	84

b) Weights of 50 year old mothers with 20 year old daughters are given below. Find the weight of the daughter whose mother's weight is 70 kg. **[4]**

Weight of mothers X	71	65	66	71	70	70	73	72	68	66	67
Weight of daughters Y	62	59	62	69	65	65	64	66	64	65	63

Q6) a) Explain the properties of a good measure of Variation and explain important methods of studying Variation. **[6]**

b) What is the relationship between mean, mode and median? Find out median of the distribution when mean and mode are 43.8 and 42.8 respectively. **[2]**

c) Mean of marks of 50 students was found to be 56. Find the new mean if after re-evaluation, one student got his marks increased from 35 to 53.**[2]**

Q7) a) Explain in detail the process of filing a patent. **[3]**

b) With suitable examples, comment on the relevance of IPR in research field. **[4]**

c) List at least three criteria for patentability. **[3]**

Q8) a) Write a short note on reviewing literature and writing a literature survey. **[3]**

b) Write a note on "Types of Reports". **[4]**

c) Explain in short, the role of Computer in research. **[3]**

Total No. of Questions : 8]

SEAT No. :

P4397

[Total No. of Pages : 2

[4860]-1384

M.E. (Polymer Engineering)

POLYMER PROCESSING AND TESTING

(2013 Credit Pattern) (Semester-II) (509121)

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

Instructions to the candidates:

1) ***Solve any 5 questions from total 8 questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Explain the three point and four point bending test method used to determine flexural strength and modulus. **[5]**

b) Write in short about power factor and permittivity. **[3]**

c) Explain the significance of brittleness temperature. **[2]**

Q2) a) Explain any one process model for thermoforming. **[4]**

b) Explain the melt fracture and sharkskin effect in blow molding and explain how Deborah number can be used to analyze it. **[4]**

c) Explain with neat sketch any one type of pipe calibrator used in extrusion of pipe. **[2]**

Q3) a) Write in short about radiography as nondestructive testing method. **[4]**

b) Discuss test method for surface and volume resistivity. **[3]**

c) Explain the test method for determination of vicat softening Temperature. **[3]**

Q4) a) Explain the significance of consistency of any two of the following process parameters for shot weight repeatability in case of injection moulding. **[5]**

i) Melt cushion

ii) V-P switch over point

iii) Plasticizing end position

b) Explain the residence time distribution for typical Bus ko-kneader. Explain why wiping is better. **[5]**

P.T.O.

Q5) a) Explain the conditioning of test specimens in order to bring the test pieces to standard testing conditions. **[5]**

b) Discuss in detail the solvent stress cracking resistance tests. **[5]**

Q6) a) Write in short about reaction injection moulding. **[4]**

b) Define and explain the test method for measurement of thermal conductivity of polymers. **[4]**

c) Explain dielectric strength. **[2]**

Q7) a) Draw a neat sketch of coat hanger die and explain the design procedure. **[5]**

b) Explain the principle of barrier screw and explain also the melting mechanism. **[3]**

c) Explain why in devolatalizing screws (1/d) ratio of the screw is required to be more than the standard design. **[2]**

Q8) a) Explain the charpy and Izod test methods used for impact testing in details. **[5]**

b) Explain ultrasonic and acoustic emission non-destructive test methods in details. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4398

[Total No. of Pages : 2

[4860] - 1385

M.E. (Polymer Engineering)

POLYMER PHYSICS AND CHARACTERIZATION

(2013 Credit 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.***
4) ***Assume Suitable data, if necessary.***

Q1) a) Polymeric solution properties change according to concentration (very dilute, semi-dilute concentrated of solutions. Explain the concept. **[4]**

b) Explain the concept of theta solvent. **[3]**

c) State peculiar characteristics of polymer solution. **[3]**

Q2) a) Explain following properties and elaborate experimental method to determine them: **[6]**

i) Creep,

ii) Thermal relaxation.

b) Explain how DSC can be used to blend miscibility. **[4]**

Q3) a) Explain working principle of TGA. **[2]**

b) With suitable schematic explain how filler content is determined by TGA. **[3]**

c) Write short note on test method used to measure volume and surface resistivity. **[5]**

P.T.O.

Q4) a) Explain the Bragg's law used as basis for XRD. **[3]**

b) With appropriate schematic explain how XRD can be used to determine percent crystallinity of polymer sample. **[4]**

c) Comment about relevance of storage and loss modulus. **[3]**

Q5) a) Explain the concept of universal calibration curve of GPC. **[4]**

b) Compare between scanning electron microscopy and optical microscopy. **[6]**

Q6) a) Write short note on WLF equation. **[4]**

b) Briefly explain various modes of vibrations in FTIR. **[6]**

Q7) a) Discuss about use of proton NMR in characterization of polymer. **[5]**

b) Write short note on contact angle measurement technique. **[5]**

Q8) a) Explain any one method used to study polymer degradation. **[5]**

b) Briefly explain working principle and application of SAXS. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4399

[Total No. of Pages : 2

[4860] - 1386

M.E. (Polymer Engineering)

POLYMER STRUCTURE AND PROPERTIES

(2013 Credit 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.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data, if necessary.***

Q1) a) Explain the concept of molecular flexibility. With suitable example explain the effect of double bond and resonance on polymer flexibility/rigidity. **[5]**

b) What do you understand by orientation induced crystallization? **[3]**

c) Comment on the bond responsible for hygroscopic nature of linear aliphatic polyamides i.e. nylons. **[2]**

Q2) a) Crystallinity of flexible chain homopolymer (e.g. PE) depends on preparation method. Justify the statement. **[5]**

b) With reference to polypropylene explain the concept of tacticity and its effect on properties. **[5]**

Q3) a) Molecular weight and molecular weight distribution affects mechanical and thermal properties. Do you agree? Justify the answer. **[6]**

b) Explain the terms - amorphous and crystalline morphologies. Give examples of each one. **[4]**

Q4) a) What is glass transition temperature? State various factors affecting Tg. **[4]**

b) Explain the terms - miscible and immiscible blends. Comment on dependency of polymeric properties on blend type. **[6]**

P.T.O.

Q5) a) Discuss about the structure development in injection moulding process. **[5]**

b) What is cross-linking of polymers? Explain how does it affect mechanical properties. **[5]**

Q6) a) Briefly explain various factors which affect polymer crystallization. **[6]**

b) Discuss about dependency of adhesion properties on polar nature of polymer. Give suitable examples. **[4]**

Q7) a) Discuss about the factors those affect gas barrier properties. **[5]**

b) Explain how particle size and shape affects properties of polymeric nanocmposites. **[5]**

Q8) a) Briefly explain free volume theory of glass transition temperature. **[4]**

b) Comment about effect of additives like plasticizers on mechanical and thermal properties. **[6]**

Total No. of Questions : 8]

SEAT No. :

P4212

[Total No. of Pages : 2

[4860]-1387

M.E. (Polymer Engineering)

POLYMER RHEOLOGY

(2013 Credit Pattern) (Semester - III) (509127) (End-Sem.)

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 logarithmic tables, slide rule, electronic pocket calculator is allowed.***

Q1) a) Explain time independent and time dependent fluids with examples. **[4]**

b) Discuss Isochronous stress strain plot. **[3]**

c) Discuss the followings: Extrudate swell, Extrudate distortion, Melt fracture. **[3]**

Q2) a) Discuss different parameters affecting the viscosity of polymer melts. **[4]**

b) Discuss the importance of stress strain characteristics. **[3]**

c) Explain the term "Viscoelasticity". **[3]**

Q3) a) Derive an expression for flow analysis using power law model. **[5]**

b) Explain in detail Maxwell model, Voigt-Kelvin model. **[5]**

Q4) a) Explain Rheological models for extensional viscosity. **[4]**

b) Discuss Glass transition and theories of glass transition. **[3]**

c) Explain WLF equation. **[3]**

Q5) a) Discuss with applicable diagram parallel disk Rheometer. **[5]**

b) Write a note on Torque Rheometers. **[5]**

P.T.O.

Q6) a) Explain in detail Rheology of Multiphase system. **[5]**

b) Write a short note on "Rheology of filled Polymers". **[5]**

Q7) a) Explain in detail role of rheology in processing. **[5]**

b) Explain with suitable examples effect of fiber loading on rheology of polymer melts. **[3]**

c) Discuss the term Activation Energy. **[2]**

Q8) a) Write a short note on "Rheology of gas containing melts." **[3]**

b) Explain with applicable model rheology of dilute fiber suspension. **[3]**

c) Discuss any two molecular theories used for rheological analysis. **[4]**

Total No. of Questions : 8] **SEAT No. :**

P4559 **[Total No. of Pages : 2**

[4860]-1388

M.E. (Polymer Engineering) (End Semester)

TRANSPORT PHENOMENON 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) ***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 logarithmic tables, slide rule, electronic pocket calculator is allowed.***

Q1) a) Explain the Cauchy's Principle with suitable example. **[4]**

b) Discuss different models to express rheological behavior of polymeric fluids. **[4]**

c) Differentiate between the Newtonian and Non-Newtonian fluids. **[2]**

Q2) a) Derive equation for momentum flux and velocity for flow of two immiscible fluids. **[4]**

b) Explain the Stress tensor and Symmetric tensor. **[3]**

c) Discuss time dependent and time independent fluids with example and give proper mathematical relation. **[3]**

Q3) a) Write down the following steps to find out the number of theoretical stages for multistage distillation column. **[5]**

b) Give the brief introduction of different theories of diffusion. **[3]**

c) Give each industrial example of solid liquid extraction and liquid liquid extraction. **[2]**

P.T.O.

Q4) a) Explain the steady incompressible two dimensional boundary layer flow equation. **[5]**

b) Derive expression for diffusion in stagnant gas film. **[5]**

Q5) a) Explain briefly the concept of diffusion coefficient and dispersion. **[3]**

b) Explain in detail Mechanism and theories of diffusion through polymers. **[3]**

c) Write in detail about permeability of polymers and factors affecting it. **[4]**

Q6) a) Write a note on Multicomponent Diffusion. **[4]**

b) Give the detail applications of integral techniques to energy transfer. **[4]**

c) Distinguish between forced convection and free convection. **[2]**

Q7) a) Explain with neat diagram equipment used in liquid-liquid extraction. **[5]**

b) Write a short note on Heat and mass transfer on polymeric system. **[5]**

Q8) a) Explain with example the importance of viscous dissipation in energy transport. **[5]**

b) Explain any two different applications of diffusion. **[5]**

Total No. of Questions : 8]

SEAT No. :

P4560

[Total No. of Pages : 2

[4860]-1389

M.E. (Printing)

PROBABILITY, STATISTICS AND REGRESSION ANALYSIS

(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Attempt any Five questions.***
2) ***Assume suitable data, if necessary.***

Q1) A marksman (blindfolded), finds that on the average he hits the target 4 times out of 5. If he fires 4 shots, what is the probability of, **[10]**

a) more than 2 hits?

b) at least 3 misses?

c) exactly 2 hits?

d) miss one shot?

Q2) From the following bi-variable probability distribution function of x and y, find. **[10]**

a) $P(x \leq 1, y=2)$

b) $P(x \leq 1)$

c) $P(y=3)$

d) $P(y \leq 3)$

e) $P(x<3, y \leq 4)$

x/y	1	2	3	4	5	6	$\sum$ y P(x,y)
0	0	0	1/32	2/32	2/32	3/32	8/32
1	1/16	1/16	1/8	1/8	1/8	1/8	10/16
2	1/32	1/32	1/64	1/64	0	2/64	8/64
$\sum$ xP(x,y)	3/32	3/32	11/64	13/64	6/32	16/64	1

P.T.O.

Q3) From a group of 5 Indians, 6 Polish, and 7 Americans an executive committee of 4 people is formed by drawing lots. What is the probability that executive committee contain, **[10]**

a) 2 Indian and 2 Polish?

b) 1 Indian, 1 Polish and 2 American?

c) all 4 Americans?

d) all 4 Indians?

Q4) Explain about : **[10]**

a) OC curve

b) X bar chart

c) P chart

d) C chart

e) Quality

Q5) The values of different sample values are given below, compute centerline upper Control limit and lower control limit for X bar and R charts? (A2=1.02, D3=0, D4=2.57). **[10]**

Value	Sample-1	Sample-2	Sample-3	Sample-4	Sample-5
X bar	10.5	10.4	10.0	10.5	9.8
R	2.1	1.3	0.4	1.2	2.3

Q6) Explain about planning an experiment with flow chart. **[10]**

Q7) The numbers of weekly customer complaints are monitored at a large hotel using a c-chart. Complaints have been recorded over the past twenty weeks. Develop control limits using the following data, and draw chart. **[10]**

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
No. of complaint	3	2	3	1	3	3	2	1	3	1	3	4	2	1	1	1	3	2	2	3	44

Q8) Describe about different statistical quality improvement methods. **[10]**

Total No. of Questions : 6]

SEAT No. :

P4400

[Total No. of Pages : 1

[4860] - 1390
M.E. (Printing)
PRINTING TECHNOLOGY MANAGEMENT
(2013 Credit Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***All questions compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

Q1) a) Explain production model structure for a commercial printing business in terms of production, supply and service. **[9]**

b) Explain different types of print products where outsourcing of specific costly operations need to be done. **[9]**

OR

Q2) Explain with help of flowchart process for shopfloor management for a flexo label printing press. **[18]**

Q3) a) What is the need for a Quality Program for any organization. **[8]**

b) Describe a continuous quality improvement plan for a newspaper production system. **[8]**

OR

Q4) Explain activities of a quality assurance department in CTP plate making section. **[16]**

Q5) Explain following: **[16]**

a) Quality costs.

b) Failure costs.

OR

Q6) Differentiate between chance variation and assignable cause variation. Explain with example for production by offset process. **[16]**

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Total No. of Questions : 3]

SEAT No. :

P4401

[Total No. of Pages : 1

[4860] - 1391

M.E. (Printing Engineering & Graphic Communication)

MODERN TRENDS IN PRINTING

(2013 Credit Pattern) (508103) (Semester - I)

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

Instructions to the candidates:

1) ***Draw neat diagram wherever necessary.***
2) ***Figures to right indicate full marks.***

Q1) Explain in detail print attributes for offset. **[18]**

OR

Explain in detail configuration of offset press.

OR

Explain in detail closed and open loop inking system.

OR

Explain in detail effect of speed on gravure printability.

Q2) Explain the working of ELS technology. **[16]**

OR

Explain the loading systems for impression roller.

Q3) Mention the care and maintenance for gravure cylinders. **[16]**

OR

Explain the effect of temperature and humidity on printability.

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Total No. of Questions : 8]

SEAT No. :

P4561

[Total No. of Pages : 1

[4860]-1392

M.E. (Printing)

RESEARCH METHODOLOGY

(2013 Credit Pattern)

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

Instructions to the candidates:

1) ***Attempt any Five questions.***
2) ***Assume suitable data, if necessary.***

Q1) State the meaning and objectives of research. **[10]**

Q2) Discuss the research status in India and problems encountered by researchers. **[10]**

Q3) Describe techniques involved in defining a problem in research. **[10]**

Q4) State the features of a good research design. **[10]**

Q5) Explain steps involved in sample design. **[10]**

Q6) Explain in brief, the methods of data collection. **[10]**

Q7) State merits and demerits of case study method. **[10]**

Q8) Describe the layout of research report. **[10]**

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Total No. of Questions : 4]

SEAT No. :

P4562

[Total No. of Pages : 1

[4860]-1393

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

COLOR SCIENCE

(2013 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Explain following terms : **[9]**

a) Image formation by eye.
b) Rods and cone distribution.
c) Eye axes.

OR

Explain spectral power distribution and its application for color matching. **[9]**

Q2) Explain the procedure of instrumental color assessment method vis a vis manual method in details. **[9]**

OR

Explain Maxwell's method of color matching. **[9]**

Q3) Profilling lies at the heart of quality printing. Justify. **[16]**

OR

To get Quality and consistancy in printing which are the 4 C's of color management needed to executed? **[16]**

Q4) Materials modify the light via Reflection and scattering. Justify with the suitable diagram. **[16]**

OR

Explain with the help of suitable diagram how materials modify the light via :

a) Refraction.
b) Dispersion

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Total No. of Questions : 3]

SEAT No. :

P4402

[Total No. of Pages : 1

[4860] - 1394

M.E. (Printing Engineering & Graphic Communication)

WEB HANDLING ON PRESS

(2013 Credit Pattern) (Semester - II) (508108)

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 web viewing system for a press. **[18]**

OR

Explain the treatments required on the substrate.

OR

Explain in detail the tension control system for a press.

OR

Explain in detail circumferential register control system.

Q2) Explain in detail balancing of rollers. **[16]**

OR

Explain the correction methods for guiding a web.

Q3) Explain the role of web transport rollers in a press. **[16]**

OR

Write notes on:

a) Lead-in and Lead-out rollers.

b) Idler Roller specifications.

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Total No. of Questions : 3]

SEAT No. :

P4403

[Total No. of Pages : 1

[4860] - 1395

M.E. (Printing Engineering and Graphic Communication)

SUBSTRATE AND INK

(2013 Credit Pattern) (508109) (Semester - II)

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

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Assume suitable data wherever necessary.***
3) ***Figures on right indicate marks.***

Q1) a) Explain pulp manufacturing processes. **[6]**

b) Discuss any two Mechanical properties of paper and testing methods. **[6]**

c) What are electrographic inks? **[6]**

Q2) What is costing? Write in detail about elements of costing. **[16]**

Q3) Write notes on: **[16]**

a) VOC and its significance in printing.

b) Sustainability and Waste management.

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Total No. of Questions : 3]

SEAT No. :

P4404

[Total No. of Pages : 1

[4860] - 1396

M.E. (Printing Engineering and Graphic Communication)
PRINTED ELECTRONICS AND RFID
(2013 Credit Pattern) (608101) (Semester - III)

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

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Assume suitable data wherever necessary.***
3) ***Figures on right indicate marks.***

Q1) a) State and explain any one traditional Electronics manufacturing method. **[6]**

b) Explain the properties of substrates required for use in printed electronics. **[6]**

c) Explain the methods that can be employed for printed electronics. **[6]**

Q2) What is RFID? Explain construction of RFID tag. **[16]**

Q3) Discuss applications of OE in healthcare management. **[16]**

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Total No. of Questions : 3]

SEAT No. :

P4405

[Total No. of Pages : 1

[4860] - 1397

M.E. (Printing Engineering & Graphic Communication)
ADVANCES IN CONVERTING AND PACKAGING
(2013 Credit Pattern) (608102) (Semester - III)

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 security features used in packaging. **[18]**

OR

Explain in detail Air Knife and Blade coating techniques.

OR

Explain in detail dry and wet lamination for converting.

OR

Explain in detail shrink and stretch wrapping techniques.

Q2) Explain the Bag-in-Box for liquid products. **[16]**

OR

Polyolefins play an important role in packaging. Explain.

Q3) Explain in detail Aseptic packaging. **[16]**

OR

Explain in detail Retort packaging.

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