Total No. of Questions : 8]

SEAT No. :

P3474

[Total No. of Pages : 2

[4660]-10
M.E. (Civil) (Const. & Mgmt.)
VALUE ENGINEERING
(2008 Pattern) (Elective)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) Detail out the need of adopting value engineering in the Civil Engineering industry. **[18]**

Q2) Differentiate between value, value analysis, valuation and value engineering with examples from the construction industry. **[16]**

Q3) Discuss the various elements associated with "Lean Construction". **[16]**

Q4) Explain: **[4 × 4 = 16]**

a) Waste in Construction

b) Wastage - Causes, Prevention

c) NPV

d) Strategic management for value engineering

SECTION - II

Q5) Explain with the flow diagram concept, major heads in value engineering.**[18]**

Q6) Discuss various ways in which the data is generated during the pre-analysis phase so that value engg. can be conducted. **[16]**

P.T.O.

Q7) Discuss the importance of brainstorming, innovation, use of technology and focus on sustainability aspects in value engg. **[16]**

Q8) What governance is needed so as to implement the recommendations arising out of value engg. efforts, effectively in the public sector organisations bidding out construction projects? Discuss legal issues as well. **[16]**

Total No. of Questions : 8]

SEAT No. :

P3248

[Total No. of Pages : 2

[4660]-100
M.E. (Civil) (WR & EE)
SOLID AND HAZARDOUS WASTE MANAGEMENT
(501604) (2008 Course) (Elective-I) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Enlist various objectives of solid waste management and describe the functional elements of waste management system. **[10]**

b) Elucidate the hierarchy of integrated solid waste management. **[6]**

Q2) Draw neat sketches of size reduction equipments used for solid waste Materials and explain in detail the working, design criteria and performance characteristics. **[16]**

Q3) Discuss the collection systems used for collecting solid waste. What are the means and methods for transportation of solid waste? **[16]**

Q4) Write short notes on: **[18]**

a) Sampling, characterization and monitoring responsibilities.

b) Elements of financial management plan for solid waste system.

P.T.O.

SECTION-II

Q5) Discuss in detail Present Indian scenario and measures to improve system for different functional elements of solid waste management system. **[16]**

Q6) What different types of solid wastes are generated in a Technological society? Discuss major legislations for hazardous waste management. **[16]**

Q7) Enlist various facilities for physical, chemical and thermal treatment of hazardous waste. Also discuss chemical fixation and encapsulation technique for treatment of hazardous waste. **[16]**

Q8) Write short notes on: **[18]**

a) TCLP tests and Leachate studies.

b) Design, operation and remediation of hazardous waste disposal sites.

●●●●●

Total No. of Questions : 6]

SEAT No. :

P3249

[Total No. of Pages : 1

[4660] - 102

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

b- ADVANCED WATER TREATMENT & WATER SUPPLY ENGINEERING

(2008 Course) (Semester - I) (Elective - II) (501605)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Explain in detail the principle and working of electro dialysis and ultra filtration for water treatment. **[16]**

Q2) Discuss the principle, concept and necessity of aeration. Explain various methods of aeration with neat sketches. **[16]**

Q3) 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. **[18]**

SECTION - II

Q4) Differentiate between slow sand & rapid sand gravity filters. Explain backwashing of rapid sand filters. **[16]**

Q5) Discuss Adsorption processes, types of adsorption, factors influencing adsorption & adsorption isotherms. **[16]**

Q6) a) What is the theory of disinfection? State the factors affecting disinfection. Discuss the chemistry of chiorination. **[9]**

b) Briefly discuss ion exchange method, ion exchange chemistry and it's applications for hardness and TDS removal. **[9]**

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Total No. of Questions : 8]

SEAT No. :

P3295

[Total No. of Pages : 2

[4660] - 103

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

REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM FOR WATER RESOURCES MANAGEMENT

(2012 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

Q1) a) Discuss the principles of photogrammetry and its applications in water resources planning. **[8]**

b) Write a note on basics of Remote Sensing. **[5]**

Q2) a) Write in brief the term stereoscopic analysis. **[4]**

b) Describe the stages of Remote Sensing with neat sketch. Discuss in detail the interaction of EMR with 'Atmosphere'. **[8]**

Q3) a) Describe the important features of LANDSAT images. State the elements of image interpretation in short. **[8]**

b) What are FCC images? Write the advantages of FCC. **[5]**

P.T.O.

Q4) a) Discuss various characters of IR images. Write the methods used for corrections in images. **[8]**

b) Write a note on Thermal and Infra-Red Images. **[4]**

Q5) a) Write in detail applications of RSGIS. **[8]**

b) Discuss in short buffering. **[5]**

Q6) a) Describe the important applications of Thematic Maps. Describe Supervised and Unsupervised classification. **[8]**

b) Describe Raster and Vector. **[4]**

Q7) a) Write an essay on Data collection and input processing in GIS. Describe Spatial and Attribute Database. **[8]**

b) Write in short the Errors in GIS. **[5]**

Q8) a) Explain RS application in Wet Land Management with flow chart. Write in short the software's used in GIS for Water Resources. **[8]**

b) Explain in brief 'DEM' & its application. **[4]**

Total No. of Questions : 8]

SEAT No. :

P2708

[Total No. of Pages : 4

[4660] - 105

M.E. (Civil) (Water Resources and Environmental Engg.)
OPTIMIZATION TECHNIQUES
(2012 Pattern) (Semester - II) (501608)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Write the applications of system approach in civil engineering? Explain the 'need' implementation of system approach in civil engineering field? Explain with suitable example. **[8]**

b) Solve by BIG M method. **[8]**

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

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

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

$x_2 - 2x_3 \geq 8$,

$x_1, x_2, x_3 \geq 0$.

Q2) a) Explain the meaning and significance of following terms with examples. **[8]**

i) Slack variables,

ii) Surplus variables,

iii) Artificial variables

iv) Infeasibility

P.T.O.

b) Solve the problem by Two phase method **[8]**

Maximize $Z = 5x - 2y + 3z,$

Subject to, $2x + 2y - z \geq 2,$

$3x - 4y \leq 3,$

$y + 3z \leq 5$

$x, y, z \geq 0.$

Q3) a) Determine whether the followng functions are convex or concave. **[8]**

i) $f(x) = e^x$

ii) $f(x) = -8x^2$

iii) $f(x_1, x_2) = 3x_1^3 - 6x_2^2$

iv) $f(x_1, x_2, x_3) = 4x_1^2 + 3x_2^2 + 5x_3^2 + 6x_1x_2 + x_1x_3 - 3x_1 - 2x_2 + 15$

b) Find minimum of '$f = x(x\text{-}1.5)$' in the interval of (0,1) to within 10% of the exact value. **[8]**

Q4) a) Write the introduction and procedure of Golden section method. **[8]**

b) Maximize $Z = 60x - x^2$ in the interval (0,100) with an accuracy of 0.1% by using Fibonacci method, using $n = 4$. **[10]**

SECTION - II

Q5) a) What is 'principle of optimality' in dynamic programming? What is recursive equation? How it should be solved? **[8]**

b) Solve the following game by dominance method. **[8]**

	Player B				
		I	II	III	IV
Player A	1	9	4	8	0
	2	5	8	4	8
	3	8	4	10	0
	4	0	8	0	16

Q6) a) Explain the operating characteristics of queuing models. **[8]**

b) Construction equipment is to be transported from place 1 to place 11. The equipment can be transported along different routes. The travel distance along different routes from place '*i*' to place '*j*' are given below. Use dynamic programming to determine the shortest route between place 1 to place 11. Write the recursive equation for each stage. **[8]**

Place 'i-j'	Dist. in Km	Place 'i-j'	Dist. in Km
1-2	30	5-8	21
1-3	34	5-9	33
1-4	36	5-10	33
2-5	29	6-8	22
2-6	27	6-9	24
2-7	30	6-10	29
3-5	31	7-8	33
3-6	25	7-9	32
3-7	23	7-10	34
4-5	28	8-11	37
4-6	27	9-11	28
4-7	26	10-11	36

Q7) a) Vehicles arrive at service station in a Poisson fashion at an average rate of 45 minutes. The average time taken for service is 30 min. with exponential distribution. Determine **[8]**

i) The chance that a vehicle will be serviced straight away.

ii) The proportion of time the service station is busy.

iii) The average no. of vehicles I the queue and the system.

iv) The average time spent by vehicle waiting in the queue and the system.

v) The probability that there are two vehicles in the queue.

b) Customers arrive at service facility to get the required service. The inter arrival and service times are constant and are 1.8min and 4 min respectively. Simulate the system for 14 min. Determine average waiting time of a customer and idle time of service facility. **[8]**

Q8) a) Find the sequence that minimizes the total elapsed time required to complete the following tasks on two machines. **[10]**

Task	A	B	C	D	E	F	G	H	I
Machine I	2	5	4	9	6	8	7	5	4
Machine II	6	8	7	4	3	9	3	8	11

b) Explain the following: **[8]**

i) Minimax and maxmin principles

ii) Pure and mixed strategies

iii) Two-person zero sum game

iv) Method of matrices.

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Total No. of Questions : 8]

SEAT No. :

P2709

[Total No. of Pages : 2

[4660] - 106

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

OPEN CHANNEL HYDRAULICS

(2012 Pattern) (Elective - II) (501609)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) A 3.6m wide rectangular channel had badly damaged surfaces and had a Manning's n = 0.030. As a first phase repair, its bed was lined with concrete (n = 0.015). If the depth of flow remains same at 1.2m before and after the repair, what is the increase of discharge obtained as a result of repair. **[8]**

b) Derive Chezy's formula. Derive relative between Chezy's 'C' and Manning's 'n'. **[8]**

Q2) a) Derive Momentum equation for a hydraulic jump with neat sketch and explain why the momentum principle is used in the analysis of hydraulic jump. **[8]**

b) The Rihand dam in U.P., India, has a sloping apron stilling basin with a slope of 0.077. If the depth for a flood flow of 64.0 m^3/s per meter width is 1.93m, estimate the sequent depth, length of the jump and energy loss in the hydraulic jump. **[8]**

Q3) a) What is control section? Where it is useful? Explain any two cases of control section with suitable diagrams. **[8]**

P.T.O.

b) A trapezoidal channel having B = 6.0m, side slope m = 2.0, S_o = 0.0016, Manning's n = 0.02, carries a discharge of 12.0 m^3/s. Calculate and plot the back water curve produced due to operation of a sluice gate at a downstream side which backs up the water to a depth of 4.0m immediately behind it. Use direct step method. **[8]**

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

a) Standard step method of GVF computation

b) Location of hydraulic jump

c) M and S profiles of GVF

d) Types of open channels.

SECTION - II

Q5) a) Define Spatially varied Flow and give its detail classification. **[8]**

b) Derive the De Marchi equation for side weirs. **[8]**

Q6) a) What is flood routing? Describe categories of flood routing. List hydraulic and hydrologic flood routing methods. Derive equation for spatially varied flow with increasing discharge. **[8]**

b) Describe explicit method of channel flood routing. **[8]**

Q7) a) What is dam break problem? Derive the equation for discharge intensity in dam break problem. **[8]**

b) Derive differential form of monoclinal rising wave. **[8]**

Q8) Write short notes on (any three) **[18]**

a) Types of surges,

b) Classification of bottom racks.

c) Method of characteristics,

d) Saint Venant's equation for celerity of wave.

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Total No. of Questions :8]

SEAT No. :

P3250

[Total No. of Pages :2

[4660]-107

M.E. (Civil - Water Resource and Environmental Engineering)
ADVANCE WASTE WATER TREATMENT
(2012 Course) (Semester - II) (501610)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Explain the physico, chemical and biological characteristics of wastewater. **[10]**

b) Write the basic principle and function for the secondary sedimentation tank. **[6]**

Q2) a) Explain the procedure for the design of reactor with respect lab scale and pilot scale. **[6]**

b) Explain how the hydraulic characteristics are considered during the mass balance of reactor for the anaerobic process. Explain with any example. **[10]**

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

i) Screen Chamber

ii) Disposal of screen material

b) Design PST 5 MLD. Assume the necessary data. **[8]**

Q4) a) Explain the theory of coagulation. **[10]**

b) Explain the factor affecting flocculation process. **[6]**

P.T.O.

SECTION -II

Q5) a) Write the design steps for ASP. **[6]**

b) A single stage trickling filter is designed for an organic loading of 12000 kg of BOD in raw sewage per Ha-m per day. Recirculation ratio is 1.25. The filter treats 10 mld of raw sewage with a BOD of 250mg/1. Using NRC equation, determine the strength of the effluent. **[10]**

Q6) a) Explain the objectives of the modification of TF. **[6]**

b) Explain with a neat sketch: working of a single stage digester. Explain empirical formulae used to find the volume of the single stage digester. **[10]**

Q7) a) Explain concept of gas transfer and solid separation. **[10]**

b) Compare ASP and TF. **[6]**

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

i) Nano filteration

ii) Factors affecting adsorption

b) Explain any two methods for the removal of dissolved solids. **[8]**

EEE

Total No. of Questions : 8]

SEAT No. :

P3251

[Total No. of Pages : 2

[4660] - 109

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

b - NOISE POLLUTION AND CONTROL TECHNIQUE

(2008 Course) (Elective - III) (Semester - II) (501611)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Attempt three Questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) Describe sound propagation characteristics with neat sketch. Also explain how sound is absorbed in air. **[16]**

Q2) What is intensity of noise? How it can be measured? Also discuss equal loudness counters with neat sketch. **[16]**

Q3) Draw sketches for sound/noise signal and its power spectrum and explain in detail. **[16]**

Q4) Write note on: **[18]**

a) Types of sources of noise.

b) Protective equipments and basic principles of noise control.

P.T.O.

SECTION - II

Q5) Discuss the effect of noise on task performance and Cardio-vascular system. Explain with case studies. **[16]**

Q6) a) Enlist various sources of noise pollution specially related to civil Engineering works. How they are controlled at source. **[8]**

b) Elucidate sources of Noise from industry and its control measures. **[8]**

Q7) Discuss in detail traffic noise? Also give case study of traffic noise due to various vehicles. **[16]**

Q8) Write note on: **[18]**

a) Existing legal provisions for controlling noise and noise level standards.

b) Air craft and Airport noise any case study.

Total No. of Questions : 8]

SEAT No. :

P3296

[Total No. of Pages : 2

[4660] - 110

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

GROUND WATER MODELING

(2012 Pattern) (Elective - III) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:-

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

Q1) a) Write in detail the fundamentals of groundwater modeling. **[8]**

b) Write in short the safe yield of aquifer. **[5]**

Q2) a) Write in detail the Groundwater modeling using FEM. **[8]**

b) Write in brief modeling as a tool of management. **[4]**

Q3) a) Write in detail the finite difference expression of Laplace's Equation. **[8]**

b) Write a note on Types of Groundwater model. **[5]**

Q4) a) Discuss in detail the ground water modeling based on content of Mathematical modeling. **[8]**

b) Short note on Groundwater basin management. **[4]**

P.T.O.

Q5) a) Write in detail the vertical distribution of groundwater. **[8]**

b) Short note on continuity equation for steady – state flow. **[5]**

Q6) a) Write an essay on – Constraints on groundwater development. **[8]**

b) Write in short the Hydrological Regime. **[4]**

Q7) a) Write in detail Planning of groundwater development – water balance. **[8]**

b) Write a note on Groundwater estimation norms in India. **[5]**

Q8) a) Write Short Notes on any two : **[8]**

i) Darcy's Law.

ii) Transmissivity and Storage of Co-efficient.

iii) Recharge and Discharge.

b) Write in brief the specific yield and specific retention. **[4]**

Total No. of Questions : 10]

SEAT No. :

P2710

[Total No. of Pages : 3

[4660] - 111

M.E. (Civil) (Water Resources and Environmental Engg)
INDUSTRIAL WASTE MANAGEMENT
(2012 Course) (Semester - II) (Elective - III) (501611)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Define sewage and industrial effluent. Differentiate between industrial and municipal waste water. **[8]**

b) What are different effluent standards. **[8]**

Q2) a) Explain self purification of river water with different zone. **[8]**

b) What are different techniques for waste minimization. **[8]**

Q3) a) Industry having discharge 1000 m^3/s of waste water which is fully saturated with dissolved oxygen and flowing at rate of 1500 m^3/s with velocity of 0.1m/s. 5 day BOD of industrial waste at given temperature is 300mg/L Find the when and where critical D.O. deficit will occur in down stream side of river.

Assume BOD of Mix = 27mg/L, D0 = initial D.O. deficit = 2mg/L

Use Streeter-Phelps equation given in data sheet. **[8]**

b) Explain oxygen sag curve. **[8]**

P.T.O.

Q4) a) Design ETP for Industrial waste water of 10,000 m^3/d, BOD of I/F = 200mg/L, E/F BOD = 10mg/L, COD = 5000 mg/L Y = 0.5, K_d = 0.05/day, MLSS = 4000 mg/L, Return sludge concentration = 10,000mg/L, MCRT = 10 day. **[8]**

b) Explain different methods of removal of Zn from waste water. **[8]**

Q5) a) Find the capacity of anaerobic sludge digester **[9]**

i) MCRT = 10d,

ii) S.S. = 600 mg/L

iii) S.S. removed in PST = 60%

iv) Sp. Gravity of sludge = 1.04

v) Concentration of solids in sludge Ps = 0.06

vi) Density of water = $1000 kg/m^3$

Find

1. Sludge produced due to S.S. removed
2. Volume of primary sludge
3. Volume of digester

Use data sheet.

b) Explain neutralization and equalization. **[9]**

SECTION - II

Q6) a) Explain methods of removal of nitrogen from industrial waste water and explain any one method. **[8]**

b) 10,000 m^3/d of waste water containing 49mg/L of Zn and 12mg/L of Cu is treated by chemically (Lime dose) Determine the quantity of lime required for removal of Zn and Cu. Use following table. **[8]**

Chemical	Mg/L concentration required for removal	Metal removed
Lime	2.38	Cu
Lime	2.03	Zn
SO_2	1.85	Cr^{+6}

Q7) a) Draw a flow diagram for treating of textile and steel industry. **[8]**

b) What is necessity of common effluent treatment plant (CETP). Enlist treatment units used for CETP. **[8]**

Q8) a) What is role of MPCB in controlling pollution from industrial waste water. **[8]**

b) Design ETP for textile industrial waste for the following data **[8]**

$Q = 100\ m^3/d$, pH = 5-6, BOD = 1000mg/L, MLVSS. = 1000mg/L, Cr^{+6} = 500 mg/L, Y = 0.04, K_d = 0.02 per day, MCRT = 10 days, K = 0.5.

Design:

1. PST capacity
2. Quantity of lime required for neutralization of lime (1 Lit of W.W. required 0.8 gm of lime)
3. Volume of reactor
4. F/M ratio
5. SLR.

Q9) a) Explain procedure for disposal of hazardous waste. **[8]**

b) Write short note on membrane separation technique. **[8]**

Q10) Write short note on following (Any three). **[18]**

a) Common Effluent Treatment Plant.

b) Treatability index.

c) Activated Sludge Process.

d) Electro dialysis.

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Total No. of Questions : 8]

SEAT No. :

P3297

[Total No. of Pages : 2

[4660] - 113

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

ENERGY AND ENVIRONMENT

(2008 Pattern) (Elective - IV)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Enlist various conventional energy sources. Explain in detail their advantages and disadvantages. **[8]**

b) Explain in detail, the need for harnessing energy sources. **[8]**

Q2) a) Explain in detail hydropower as a sustainable energy source. Comment on hydropower projects in India. **[8]**

b) Enlist various non conventional energy sources. Explain their advantages and disadvantages in detail. **[8]**

Q3) a) Explain in detail : solar energy as source of energy. Explain in detail : solar energy potential in India. **[8]**

b) Explain in detail various mechanisms of harnessing solar energy. **[8]**

P.T.O.

Q4) a) Explain in detail energy requirement of India and need of finding alternative sustainable energy sources. **[10]**

b) Explain in detail need for R & D in energy sector in India. Explain role played by government in the same. **[8]**

SECTION - II

Q5) a) Explain in detail : biogas potential in India. **[8]**

b) Explain in detail : environmental impacts of biomass. What are the challenges in the same? **[8]**

Q6) a) Explain various methods of storage of energy. What are the limitations of these methods? **[8]**

b) Explain in detail environmental consequences of energy storage systems. **[8]**

Q7) a) Explain in detail various energy recovery systems used in industries. **[8]**

b) Explain importance of cogeneration plants in sugar industry. **[8]**

Q8) a) Write notes on (any two) : **[10]**

i) Biogas as vehicle fuel.

ii) Fugitive emissions in industries.

iii) Public awareness for sustainability in energy sector.

b) Enlist various types of digesters. Explain their peculiarities in brief. **[8]**

Total No. of Questions :8]

SEAT No. :

P2711

[Total No. of Pages :2

[4660] - 116
M.E. (Mechanical) (Heat Power)
NUMERICAL METHODS IN THERMAL AND FLUID ENGINEERING
(2008 Pattern) (Semester - I) (502101)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Solve by Trapezoidal Rule $\int_1^2\int_1^2 \frac{1}{(x+y)}\, dx\,.\,dy \quad \Delta x = 0.25, \Delta y = 0.25.$ **[17]**

Q2) Find the drag coefficient (c) for a mass m = 73.5 kg to have a velocity of 32.8m/s after falling for time t = 10 sec. The acceleration due to gravity is 9.8 m/s^2. **[16]**

Newton's second law equation for velocity is given by,

$$V = \frac{gm}{c}\left(1 - e^{-\left(\frac{c}{m}\right)t}\right)$$

Use false position method. Use 15 and 25 as initial guess values. Carry out five iterations.

Derive the equation you use.

Q3) Following table gives test values got while testing a centrifugal pump. Assuming the relation is of type $H = A + BQ + CQ^2$, where Q is the discharge in liter per second and H is head in meter of water, find the values of A, B and C. **[16]**

Q	2	2.5	3	3.5	4	4.5	5	5.5	6
H	18	17.8	17.5	17	15.8	14.8	13.3	11.7	9

P.T.O.

Q4) For the following data **[17]**

x	1	3	7	9
y	4	40	400	820

a) Find the value of $y(5)$ using Newton forward difference method.

b) Find the value of $x(600)$ using Lagrange's inverse interpolation.

SECTION - II

Q5) Solve using LU decomposition method. **[17]**

$2x + y + 4z = 12$

$8x - 3y + 2z = 20$

$4x + 11y - z = 33$

Explain partial pivoting and complete pivoting with the help of suitable example.

Q6) Consider the matrix A given by **[16]**

$$A = \begin{matrix} 3 & 2 & 1 \\ 2 & 3 & 2 \\ 1 & 2 & 3 \end{matrix} \quad \text{starting with } x = \begin{matrix} 0 \\ 0 \\ 1 \end{matrix}$$

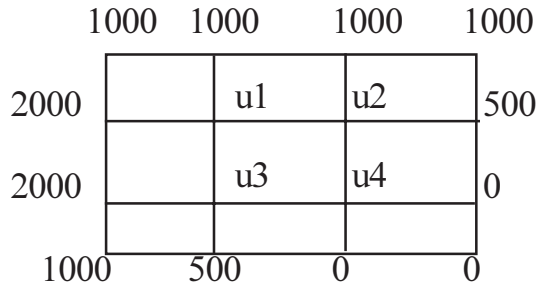
Determine the maximum eigen values using the Power method.

Carryout 7 iterations.

Q7) Solve the equation $\frac{\partial^2 y}{\partial x^2} = x \cdot \left(\frac{\partial y}{\partial x}\right)^2 - y^2$ **[16]**

For $x = 0.2$ correct upto 4 decimal place, subject to the conditions $x = 0$, $y = 1$, $\frac{\partial y}{\partial x} = 0$. The step size $h = 0.2$ using Runge-Kutta 4th ordermethod and compute y for $x = 0.2$.

Q8) Solve Laplace equation $\nabla^2 u = 0$ for given boundary conditions shown **[17]**



a) Form the equation at the nodes.

b) Carry out 4 cycles of iteration, using the relaxation method.

Total No. of Questions :12]

SEAT No. :

P2713

[Total No. of Pages : 5

[4660] - 118
M.E. (Mechanical Engineering)
Design (Mechatronics and Automotive - Heat Power)
TECHNOLOGY AND FINACIAL MANAGEMENT
(2008 Pattern) (502803) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marsk.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Explain in brief the functions of finance? What are the sources of long term, medium term and short term finance? **[8]**

b) A company manufactures two products, A and B. A forecast of the units to be sold in the first seven months of the year s given below: **[8]**

Month	Product A	Product B
January	1,000	2,800
February	1,200	2,800
March	1,600	2,400
April	2,000	2,000
May	2,400	1,600
June	2,400	1,600
July	2,000	1,800

It is anticipated that there will be no work-in-process at the end of any month and finished units equal to half the sale for the next month will be in stock at the end of each month (including previous December). Prepare a production budget for the six months period ending June 30.

OR

P.T.O.

Q2) a) What are functional budgets? Which functional budgets are most commonly used by management? Explain? **[8]**

b) The following data relate to the working of a factory for the current year: Capacity worked, 50 percent **[8]**

Fixed Costs:

Salaries	Rs. 84,000	
Rent and rates	56,000	
Depreciation	70,000	
Other administrative expenses	80,000	Rs. 2,90,000

Variable costs:

Materials	Rs. 2,40,000	
Labor	2,56,000	
Other expenses	38,000	Rs. 5,34,000

Possible sales at various levels of working are:

Capacity (percent)	Sales
60	Rs. 9,50,000
75	11,50,000
90	13,75,000
100	15,25,000

Prepare a flexible budget and show the forecast of profit at 60, 75, 90 and 100 percent capacity operations.

Q3) a) What do you mean by marginal costing? Explain with an example how do income statements prepared under the absorption costing and marginal costing concepts differ? **[8]**

b) The following cost information relates to factory X for two years: **[10]**

	2008	2009
Installed capacity (units)	10000	10000
Opening stock (units)	Nil	1,000
Closing stock (units)	1,000	Nil
Output (units)	10,000	9,000
Selling price per unit	14	14
Fixed costs for the year	85,000	85,000
Variable costs per unit	2.90	2.90

Calculate the profit under absorption costing and marginal costing for the two years.

OR

Q4) a) What are the characteristics of contract costing method? Explain? **[6]**

b) What is Activity - Based Costing? Describe the steps involved in activity based costing. **[6]**

c) Discuss the uses and assumptions of CVP analysis. Explain its significance to management? **[6]**

Q5) a) Explain the theory of consumer's demand with the help of indifference curve analysis? Also explain income effect and substitution effect? **[8]**

b) Explain the monopoly and oligopoly types of competition with appropriate examples? **[8]**

OR

Q6) Write a short note on the following: **[16]**

a) Macro economics

b) Types of unemployment

c) Effect of international trade on domestic markets

d) Methods to protect domestic trade

SECTION - II

Q7) a) Explain in brief the purpose of quality standards? What are the quality management principles defined in ISO 9001-2000 series? **[8]**

b) Distinguish between push and pull system? Explain the role of Kanban cards in JIT cycle with the help of a neat line diagram? **[8]**

OR

Q8) a) Explain the Deming's 14 point approach to Quality Management? **[8]**

b) Define Total Quality Management (TQM)? What are the elements and principles of TQM? **[8]**

Q9) a) Explain the concept of crashing of network with an example. How it is beneficial in project management decision making? **[8]**

b) Explain in brief different types of concession contracts used in BOT policy of project management? **[10]**

OR

Q10)a) Explain the stages involved in project life cycle with a neat line diagram? **[6]**

b) For the network shown in Fig.1, calculate the probability of completing the project in 50 days. The normal distribution table values corresponding to standard normal deviate of +1.03 and +1.04 are 0.3485 and 0.3508 respectively. Evaluate the following from the network diagram: **[12]**

i) Evaluate earliest start time and Latest finish time of all the events.

ii) Critical path and Critical path duration.

iii) Variance and standard deviation along critical path.

Activity	Optimistic time (days)	Pessimistic time (days)	Most likely time (days)
A	4	6	4.5
B	2	17	8
C	1	6	2
D	2	4	2.5
E	6	20	8
F	12	20	16
G	6	15	9
H	10	16	12
I	1	2	1.5

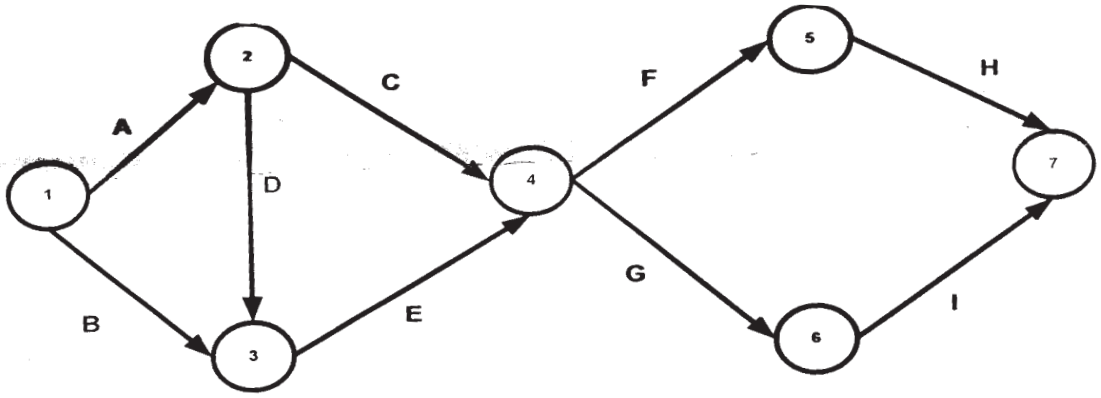


FIG 1. A Net Work

Q11)a) Discuss the process of organizing human resource functions. How can this process be completed effectively? **[8]**

b) What do you understand by 'Management by Objectives'? Explain. **[8]**

OR

Q12)a) Distinguish between autocratic and custodial model of organizational behavior? **[8]**

b) Define merit rating? State and describe any three methods of merit rating? **[8]**

Total No. of Questions : 8]

SEAT No. :

P3252

[Total No. of Pages : 2

[4660]-119

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

PERFORMANCE ASSESSMENT OF MECHANICAL EQUIPMENTS

(502104 A) (2008 Pattern) (Elective-I) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain the energy conservation opportunities in boiler and steam system. **[8]**

b) What do you understood by boiler performance? Explain the factors affecting the boiler performance. **[8]**

Q2) a) Why steam traps are required in boiler and steam system? Give its selection criteria. **[8]**

b) With neat schematic explain 'Topping cycle' and 'Bottoming cycle' cogeneration plant. State its advantages and disadvantages. **[8]**

Q3) a) Discuss step by step the procedure for performance evaluation of a typical furnace system. **[8]**

b) Write a note on: waste heat qualities with its applications. **[8]**

c) Define: Heat rate (HR) and Heat-to-power ratio (HPR). **[2]**

P.T.O.

Q4) With the help of examples, explain direct and indirect method of boiler efficiency calculation. Make appropriate assumptions. **[16]**

SECTION-II

Q5) a) Explain how the field testing is carried out for fans and blowers. **[8]**

b) Explain the energy saving opportunities for fan systems in the following area: **[10]**

i) Location of fan.

ii) Variation in air flow demand.

iii) Process.

iv) Fan type and application.

v) Motor.

vi) Fan inlet and outlet ductwork.

Q6) a) With the help of block diagram explain compressed air system. Explain the industrial uses of compressed air. **[8]**

b) Explain the procedure for field testing of pump to determine pump efficiency. **[8]**

Q7) a) What are the various types of pumps? Give energy conservation opportunities in each type. **[8]**

b) Explain the step by step procedure of energy performance assessment of DG sets. **[8]**

Q8) Write a short note on Any Three: **[18]**

a) Energy conservation in Heat pumps.

b) Heat pipe.

c) Gas turbine cogeneration system.

d) Heat exchangers in waste heat recovery.

●●●●●

Total No. of Questions : 8]

SEAT No. :

P3401

[Total No. of Pages : 2

[4660] - 12

M.E. (Civil) (Construction Management)

CONSTRUCTION CONTRACTS ADMINISTRATION & MANAGEMENT

(2008 Pattern)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Define contract as per ICA 1872. Differentiate between general conditions and particular conditions of contract with proper examples. Detail out the historical evolution of the FIDIC document. **[1 + 5 + 12]**

Q2) Explain comprehensively the weighted point score average method of bidder selection. Discuss the advantages of this method w.r.t. the conventional method. **[12 + 4]**

Q3) Compare and Contrast between EPC contracts and Item rate contracts. Which type of contract is suitable for a project to be executed on a fast track? Why? **[12 + 4]**

Q4) Differentiate between contract document and tender document. Discuss the advantages of a Pre-bid conference. Elaborate how the variations in the resource prices are adjusted in the tender. **[4 + 4 + 8]**

P.T.O.

SECTION - II

Q5) Discuss various reasons leading to construction claims and suggest various preventive measures that need to be adopted, both by the client as well as the contractor, in order to prevent construction disputes. **[10 + 8]**

Q6) State and explain the provisions made in the ICA (1872) w.r.t. :-

a) Relationships between parties to the contract.

b) Contract performance.

c) Contract termination.

d) Contract compensation.

[4 + 4 + 4 + 4]

Q7) Compare and Contrast between the "arbitration" and the "DAB" methods of dispute resolutions, with the help of a case study each. **[16]**

Q8) Discuss the following :

a) Contractual risks and their mitigation measures. **[8]**

b) Contractual correspondence, documentation and its importance, particularly in global tenders. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3444

[Total No. of Pages : 4

[4660] - 120

M.E.(Mechanical) (Heat Power Engineering) (Semester - I)

REFRIGERATION TECHNOLOGY (Elective - I)

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) In a R22 based refrigeration system, a liquid-to-suction heat exchanger (LSHX) with an effectiveness of 0.65 is used. The evaporating and condensing temperatures are 7.2°C and 54.4°C respectively. Assuming the compression process to be isentropic, find : **[16]**

a) Specific refrigeration effect

b) Volumic refrigeration effect

c) Specific work of compression

d) COP of the system

e) Temperature of vapour at the exit of the compressor.

Comment on the use of LSHX by comparing the performance of the system with a Simple Saturated VC cycle operating between the same evaporator and condensing temperatures.

P.T.O.

Q2) a) What do you understand by "Thermodynamic Irreversibility"? Discuss the effect of irreversibility on the vapour compression cycle of refrigeration with the help of T-s diagram. **[10]**

b) Explain eutectic point & typical applications for secondary refrigerants. **[6]**

Q3) Write short notes on (any three) (with the help of neat sketches) : **[18]**

a) Evaporative Condenser

b) Immersion freezing

c) Volute pump

d) Thermostatic Expansion valve

e) Working of Scroll compressor and its applications

Q4) A multi-evaporator, pressure regulating valve and single compressor vapour compression refrigeration system working with ammonia. The refrigeration capacity of high temperature evaporator operating at –6.7°C is 5 TR, while it is 10 TR for the low temperature evaporator operating at –34.4°C. The condenser pressure is 10.8 bar. Assuming saturated conditions at the exit of evaporator and condenser, ammonia vapour to behave as an ideal gas with gas constant of 0.4882 kJ/kg K and isentropic index of 1.29 and isentropic compression. **[16]**

a) Find the required power input to compressor in kW

b) Find the required power input in kW if instead of using a single compressor and pressure regulating valve, individual compressors are used for the low and high temperature evaporators.

c) Draw schematic diagram and P-h chart for (a) and (b)

d) Comment on results with reference to power input, maximum compressor discharge temperature & volumetric efficiency for (a) & (b)

Use the following data for ammonia :

T,°C	P_{sat}, (kPa)	h_f, (kJ/kg)	h_g, (kJ/kg)
–34.4	95.98	44.0	1417
–6.7	331.8	169.1	1455
27.7	1080.0	330.4	1485

SECTION - II

Q5) a) List the heat sources available for driving the absorption units. Explain the working of single effect and double effect systems for cooling. **[8]**

b) A R-22 compressor with bore of 0.1 m and stroke of 0.08 m runs at 750 rpm. The clearance volume ratio is 0.04. It runs between the evaporator and condenser temperatures of –10°C and 45°C respectively. The isentropic index *k* of compression is 1.1163. **[8]**

i) Determine the mass flow rate, refrigerating capacity and the work requirement if the mechanical efficiency is 90%. Compare the results of isentropic work requirement determined using the superheat table.

ii) If the isentropic efficiency of the compressor is 80%, determine the index of compression and compare the results for work requirement and discharge temperature.

Use following data for R-22

A) From saturation table

$T(^0C)$	Ps	v_g	h_f	h_g	s_g
–10	3.55	0.0654	34.25	247.37	0.9473
45	17.209	0.0133	101.76	261.95	0.8697

B) From superheated table

Superheat	20°C	30°C	40°C
v	0.0152	0.0161	0.0169
h	280.95	289.87	298.66
s	0.9270	0.9530	0.9781

Q6) In an aqua-ammonia absorption refrigeration system the vapour leaving the dephlegmator may be assumed to be 100% rich saturated ammonia at 40°C. The condenser and evaporator temperatures are 40°C and –20°C respectively. The absorber and generator temperatures are 30°C and 170°C respectively. The weak solution leaving the generator cools down to 50°C in the preheating heat exchanger. Determine the mass flow rates and heat transfer rates on one TR basis and the COP. Draw the schematic diagram of the system. **[16]**

Q7) a) Find the end states of isentropic compression between the saturation pressure at –20°C evaporator temperature, state 1, to saturation pressure at 35°C condenser temperature, state 2 for refrigerant $CHClF_2$. **[8]**

b) Describe the working principle of thermostatic expansion valve with the help of neat sketch. **[8]**

Q8) Write short notes on (any three) (with the help of neat sketches) : **[18]**

a) Multistage Thermo electric refrigerator

b) Electrolux refrigerator

c) Steam Jet Refrigerator

d) Types of Expansion Devices

Total No. of Questions :8]

SEAT No. :

P2714

[Total No. of Pages :2

[4660] - 121
ME (Mechanical - Heat Power)
ENERGY CONSERVATION AND MANAGEMENT
(2008 Course) (Elective - I) (502104(C)) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator Log tables and electronic calculator is allowed.***

SECTION - I

Q1) a) List down the objectives of the Energy Management Program in the industry. **[8]**

b) What is the energy conservation act 2003? What are the various steps in implementation of the energy management program in an organization. **[8]**

Q2) a) Explain the role of energy auditor and energy manager in energy management program. **[8]**

b) What is the importance of Analysis and Recommendation for Energy Audit? **[8]**

Q3) a) Write in short the steps involved in energy audit of refrigeration system. **[8]**

b) With the help of example explain payback period and life cycle costing. **[8]**

Q4) Write a short note on (Any three): **[18]**

a) Energy scenario in India.

b) Energy audit of steam power plant.

c) Energy policy and Energy action planning.

d) Energy audit (Types and Methodology)

e) Instruments used in energy audit.

SECTION - II

Q5) a) What are the technical aspects of energy efficient motors? **[4]**

b) Explain the functions and benefits of a demand controller. **[6]**

c) Explain any two automatic power factor control methods. **[6]**

P.T.O.

Q6) a) What are the various energy efficient lighting controls. **[4]**

b) Write a short note on (Any three): **[12]**

i) Efficient lighting options in India.

ii) Energy efficient windows.

iii) Lighting levels.

iv) Day lighting.

Q7) a) What are the important energy conservation opportunities in compressed air systems? **[8]**

b) Discuss the energy saving opportunities in **[8]**

i) Heat pumps and pipes.

ii) Refrigeration and air conditioning.

Q8) a) Explain where the cogeneration is applicable in different power plants? **[10]**

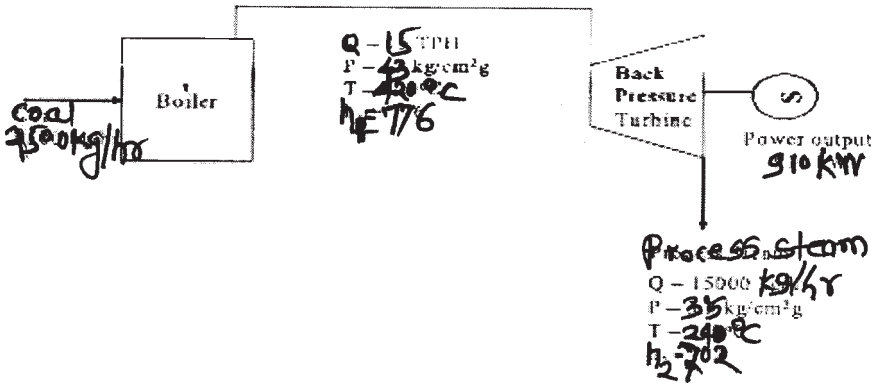
b) A medium size paper plant having an average production 120 MT/h of White paper is having a cogeneration system with a back pressure turbine. The plant steam and electrical demands are 15 TPH and 910 kW. The process flow diagram is given below. Gross caloric valve of coal is 16747 kJ/kg, average fuel consumption (boiler) is 2.5 TPH.

Design parameters:

Efficiency of alternator : 92%

Efficiency of gear transmission : 98%

Evaluate efficiency of turbine and overall plant fuel rate (kg of coal/kWh) including boiler. **[8]**



Total No. of Questions : 8]

SEAT No. :

P3253

[Total No. of Pages : 2

[4660]-122
M.E. (Mech.-Heat Power)
d-CONVECTIVE HEAT TRANSFER ANALYSIS
(502104) (2008 Course) (Semester-I) (Elective-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Air at a press of 2 bar and 200°C, gets heated as it flows through a 2.5cm diameter tube with a velocity of 10m/s. A constant heat flux condition is maintained at the wall & wall temperature is 20°C above the air temperature along the length of the tube. Make calculations for the heat transfer per unit length of the tube. Also determine the increase in bulk temperature over a 3 metre length of tube. Use the correlation.

$$Nu = 0.023\ (Re)^{0.8}\ (Pr)^{0.4}.$$

Given, $\mu = 2.57 \times 10^{-5}$ N-s/m^2, K = 0.0385 w/mk and c_p = 1025 J/kg K. **[12]**

b) State the typical values of convective coefficients for free & force convection: **[4]**

i) Air.

ii) Water.

Q2) a) Explain the concept of velocity and thermal boundary layer. Also state the effect of Prandtl no (Pr) on these two. Explain with a suitable diagram. **[10]**

b) Explain Reynold's analogy for tube-flow. **[6]**

P.T.O.

Q3) a) Show that for a laminar flow through the tube, Nusselt no. is given by $Nu_d = 4.36$. **[10]**

b) For flow over a flat plate, explain the salient features & steps used in Blausius method. **[6]**

Q4) Write notes on: **[18]**

a) Eddy viscosity.

b) Reynold's analogy.

c) Reynold's no, Grashoff no. and Stanton no.

SECTION-II

Q5) a) A vertical tube of 50mm O.D. and 2m length is exposed to steam at atm. pressure. The outer surface of the tube is maintained at a temp. of 84°C by circulating cold water through the tube. Determine the rate of heat transfer and condensate mass flow rate. The properties of saturated vapour at 100°C are [Saturation temp.].

Given:

$h_{fg} = 2257$ kJ/kg, $\rho_v = 0.596$ kg/m^3.

The prop of saturated liquid at mean film temperature are:

$\rho_l = 963$ kg/m^3, $\mu_l = 306 \times 10^{-6}$ $\frac{N-S}{m^2}$

$K_l = 0.677$ W/mk. **[10]**

b) Discuss the classical problem of film condensation over a vertical plate. **[6]**

Q6) Write detailed notes on: **[16]**

a) Combined convection.

b) Convective heat transfer through porous media.

Q7) a) Discuss any four correlations for turbulent flow heat transfer case. **[8]**

b) Explain the formulation of natural convection heat transfer from a vertical plate by using the integral method. **[8]**

Q8) Write notes on: **[18]**

a) Mixing length theory.

b) Convection in car-radiator.

c) Convection in household refrigerator.

●●●●●

Total No. of Questions :8]

SEAT No. :

P2715

[Total No. of Pages : 3

[4660] - 123
M.E. (Mechanical - Heat Power Engg.)
INTERNAL COMBUSTION ENGINES
(2008 Pattern) (Elective - II) (502105-A) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the important basic components of an IC engine? Explain them giving material composition. **[6]**

b) Define air-fuel ratio and state its effect on power output, fuel consumption and combustion pressure. **[6]**

c) Define : Equivalence ratio (φ) and lambda value (λ). **[4]**

Q2) a) A four stroke petrol engine delivers a brake power of 36.8 kW with mechanical efficiency of 80%. The air fuel ratio is 15:1 and the fuel consumption is 0.4068 kg/kWh. The heating value of the fuel is 42000 kJ/kg. Calculate indicated power, friction power, brake thermal efficiency, total fuel consumption, and air consumption per second. **[8]**

b) Give the general material selection criteria for IC engine components. **[8]**

Q3) a) A four cylinder four stroke diesel engine develops a power of 180 kW at 1500 rpm. The bsfc is 0.2 kg/kWh. At the beginning of the injection, pressure is 30 bar and the maximum cylinder pressure is 50 bar. The injection is expected to be 200 bar and the maximum pressure at the injector is set to be about 500 bar. Assume the following:

P.T.O.

C_d for injector = 0.7

S.G. of fuel = 0.875

Atmospheric pressure = 1 bar

Effective pressure difference = Average pressure difference over the injection period.

Determine the total orifice area required per injector if the injection takes place over 15^o crank angles. **[10]**

b) Explain the procedure to determine the air fuel ratio on petrol engine setup. **[6]**

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

a) MPFI gasoline injection systems.

b) Parameters affecting volumetric efficiency.

c) Controls and sensors used in modern cars.

d) Performance maps.

SECTION - II

Q5) a) What are the advantages and outcomes of electronic diesel injection system? **[6]**

b) What do you understood by nozzle lip? Why it is essential? Explain the effect at the time of starting the engine and running the engine at high speed. **[6]**

c) Explain how CFD can be used in engine development. **[4]**

Q6) a) Explain the instruments for measuring the following invisible emission. **[8]**

i) Oxides of nitrogen

ii) Carbon monoxide

iii) Unburned hydrocarbons

b) Discuss the reasons for adopting fuel injection system for SI engine. What are the various types of petrol injection system? **[8]**

Q7) a) What is thermal converter? How does it helps to reduce emissions from engines? **[8]**

b) Discuss the engine management system (EMS) in the recent vehicles. **[8]**

Q8) Write short notes on (any three) **[18]**

a) Euro - III.

b) Hartridge smoke meter.

c) Diesel particulate filter.

d) Heat release programme.

Total No. of Questions :8]

SEAT No. :

P2716

[Total No. of Pages :3

[4660] - 124
M.E. (Mechanical) (Heat Power Engg.)
ADVANCED AIR CONDITIONING & HEATING AND VENTILATION
(2008 Pattern) (Elective - II(b)) (Semester - I) (502105)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Solve section I & section II should be in separate Answer Books.***

SECTION - I

Q1) List various sensible and latent loads in Air Conditioning load calculations of a Commercial building. Also explain the procedure to calculate the Air Conditioning load for the same. **[16]**

Q2) A retail shop has following loads **[16]**

RSH = 58.15 kW, RLH = 14.54 kW.

The outside conditions are 40°C DBT and 27°C WBT. The inside design conditions are 25°C DBT and 50% RH. 70 m^3/min of ventilation air is used. Determine

a) Ventilation Load,

b) Grand Total Heat,

c) ESHF,

d) ADP,

e) Dehumidified air quantity,

f) Condition of air entering and leaving the coil. Assume Bypass Factor of coil = 0.15.

Q3) a) Write a note on VAV systems. **[8]**

b) Explain procedure of duct sizing by Equal Friction method. Give suitable examples. **[8]**

P.T.O.

Q4) Write short notes (any three): **[18]**

a) Inside and Outside design conditions.

b) Desiccant Dehumidifier.

c) Sources of noise in Air Conditioning plants.

d) Types of Grills, Diffusers and Registers.

SECTION - II

Q5) a) Differentiate between Ventilation and Infiltration. **[4]**

b) An AC system's supply fan is operating at a speed of 600 rpm against static pressure 500 Pa and requiring power of 6.50 kW. It is delivering 6 cmm at standard conditions. In order to deliver the flow rate of 4 cmm, waht are the new fan speed, static pressure and power? **[6]**

c) Write a note on Fan Performance Curves. **[6]**

Q6) a) Explain the working of Two stage Evaporative cooling with the help of neat sketch and using Psychrometric chart. **[8]**

b) Desert air cooler is used to cool the air from 40°C DBT and 15% RH to 25°C by Evaporative cooling. Estimate the volume flow rate of air in m^3/min and the quantity of water required per hour for a cooling capacity of 4 TR. **[8]**

Q7) a) Give typical layout of Central Air Conditioning Plant. List the major equipment and their selection criteria. **[8]**

b) Explain the working of VRV/VRF system. State its advantages, limitations and applications. **[8]**

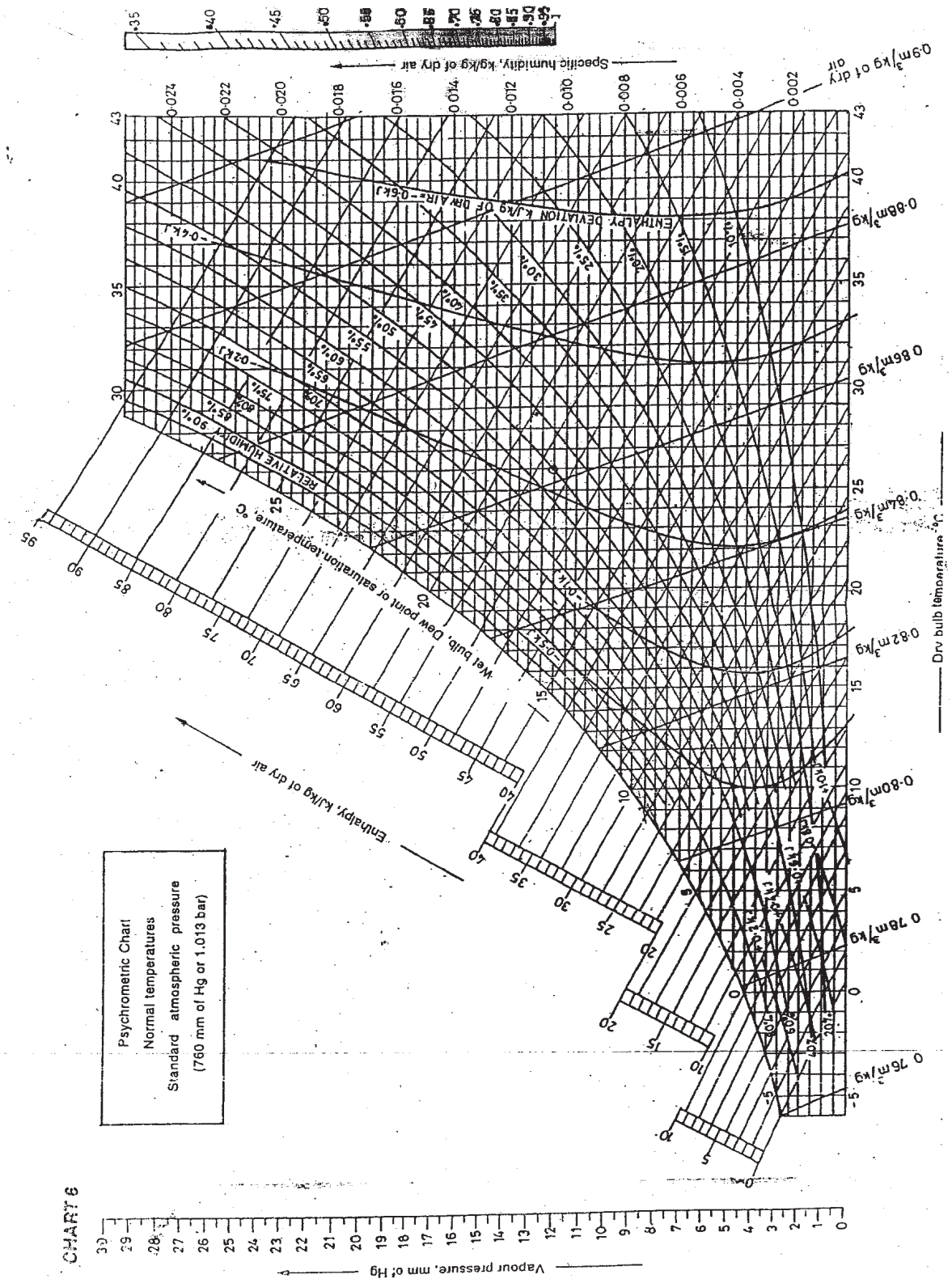
Q8) Write short notes (any three) **[18]**

a) Types of Fans in Air Conditioning.

b) Laminar Flow Cleanrooms.

c) Types of Filters in Air Conditioning.

d) Modern Controls for Odour and Bacteria.


Psychrometric Chart
Normal temperatures
Standard atmospheric pressure
(760 mm of Hg or 1.013 bar)
CHART C
Specific humidity, kg/kg of dry air
Enthalpy, kJ/kg of dry air
Wet bulb, Dew point or saturation temperature, °C
Dry bulb temperature, °C
Vapour pressure, mm of Hg
RELATIVE HUMIDITY
ENTHALPY DEVIATION kJ/kg OF DRY AIR

✦ ✦ ✦ ✦

Total No. of Questions : 8]

SEAT No. :

P3254

[Total No. of Pages :2

[4660] - 125
M.E (Mechanical - Heat Power)
c-CONVENTIONAL POWER PLANTS
(2008 Course) (502105) (Semester - I) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer for the two sections should be written in separate answer book.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of pocket calculator & different gas charts as applicable is allowed.***
6) ***Assume Suitable data. if necessary.***

SECTION - I

Q1) a) Explain the modification in the Rankine cycle to improve its efficiency. Draw T-s and schematic Diagram for each case. **[10]**

b) In a Power plant steam enters into steam Turbine at 150 bar and 450 C and comes out at 0.1 bar. Reheating the steam has been done optimally (P_{RH}/Pin = 0.3). One closed feed water heater is also placed optimally with drip to condenser. Draw T- s and Schematic diagram and calculate the efficiency. **[8]**

Q2) a) Derive the relation between change in area and change in velocity in a flow through nozzle and show that in supersonic nozzle velocity increases with increase in area. Briefly explain super saturated flow nozzle. **[8]**

b) Nozzle of impulse stage turbine receives steam at 15 bar and 300 deg. C and discharges it at 10 bar. The nozzle efficiency is 90% and the nozzle angle is 30 degrees. The blade speed is that required for maximum work and entry of the steam is without shock. The blade exit angle is 5 degrees less than the inlet blade angle. Blade friction factor is 0.9. Calculate the power and efficiency. **[8]**

P.T.O.

Q3) a) Write the sources of non-condensable gases in the condenser and effect of these gases on condenser vacuum. Show the arrangement to remove these gases and also derive the expression for vacuum efficiency. **[8]**

b) Explain what are the different methods incorporated to ensure safety in Nuclear power plants. **[8]**

Q4) a) Explain the working of coal handling system used in Power plant. **[8]**

b) Explain significance of Co-generation and what are the different industries which can benefit from Co-generation. **[8]**

SECTION - II

Q5) a) Explain use of Load curves in Power plants. **[8]**

b) Explain working of combined cycle gas power plant and derive expression for overall efficiency of plant. **[8]**

Q6) a) Explain the need of Energy storage systems. What are the different techniques to store energy and explain any one method in detail. **[10]**

b) What are the different methods used to control super heating of steam. **[8]**

Q7) a) Explain how the projection or estimation of power demand done for future energy needs. How the increasing energy demand of India should be met for future. **[8]**

b) What are the different instruments system used for normal operation and safety of a power plant. **[8]**

Q8) Write a short note on (any 3) **[16]**

a) Economic feasibility of power plant.

b) Safety in Power plants.

c) Fuel cell.

d) Fluidized bed combustion.

e) Pollution Control techniques.

Total No. of Questions :8]

SEAT No. :

P2717

[Total No. of Pages :5

[4660] - 126
M.E. (Mechanical - Heat Power Engineering)
d - ADVANCED GAS DYNAMICS
(2008 Pattern) (Semester - I) (Elective - II) (502105)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Derive an expression: $\alpha = \frac{dp}{d\rho}$; **[10]**

where a = speed of sound, p = operating pressure and ρ = density of working fluid.

Also find the Mach number for an aircraft flying at sped of 980 Kmph at

(i) sea level (take ambient temperature 20°C)

(ii) 10000 meters altitude with outside temperature of –55.3°C.

Assume for air R = 287 J/kg - K and $\gamma = 1.4$

b) Expalin with neat sketches: Propagation of disturbances in case of **[6]**

(i) Sub sonic (ii)Sonic and (iii) Super Sonic flow Scenarios.

Q2) a) Define and explain the significance of "Critical values e.g. $\frac{p^*}{p_o}$ and the stagnation values (e.g. $-p_o$) in the study of Gas Dynamics Problems.**[6]**

b) In convergent-divergent nozzle, explain the different flow cases occurred by changing the exit pressure p_e. **[5]**

c) Write a Note on Supersonic Flow Generator. **[5]**

P.T.O.

Q3) a) A re-entry vehicle (RV) is at an altitude of 10000 meters with outside temperature of –55.3° C, pressure of 1.2108×10^4 N/m^2 and has a velocity of 1330 m/s. A bow shock wave envelops the RV. Neglecting dissociation, determine the static temperature and stagnation pressure and temperature behind the shock wave on the RV centerline where the shock wave may be treated as normal shock. Assume that the air behaves as perfect gas, with R = 287 J/kg-K and $\gamma = 1.4$ **[10]**

b) Write a note on : change of flow properties across the normal shock.**[6]**

Q4) Attempt any three: **[18]**

a) Derive area velocity relation for stream tube.

b) Pitot tube - as dynamics head measuring device.

c) Hugoniot conditions and its significance.

d) Write a note on Shock tube.

SECTION - II

Q5) a) Air flow at Mach no.4.0 and pressure 1×10^5 N/m^2 is turned abruptly by a wall into the flow with a turning angle of 20°, as shown in figure(1) below. If the shock is reflected by another wall determine the flow properties M and p downstream of the reflected shock. **[10]**

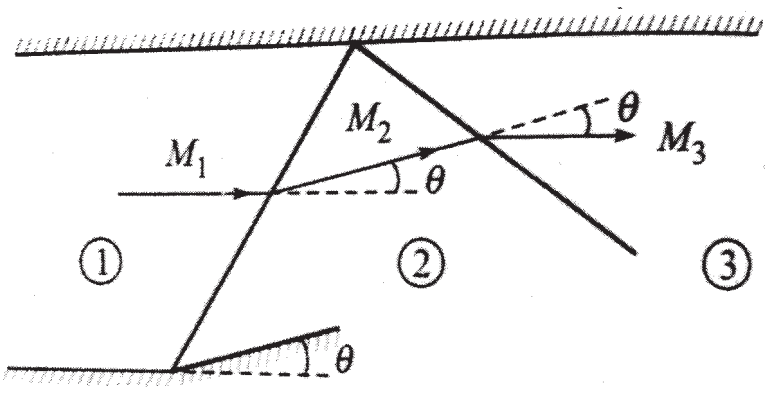


Fig. (1)

b) Explain with neat sketch: cases when Detached shocks can be seen. **[6]**

Q6) a) For the flow over the half-diamond wedge shown in figure (2) below, find the inclinations of shocks and expansion waves and pressure distributions. **[12]**

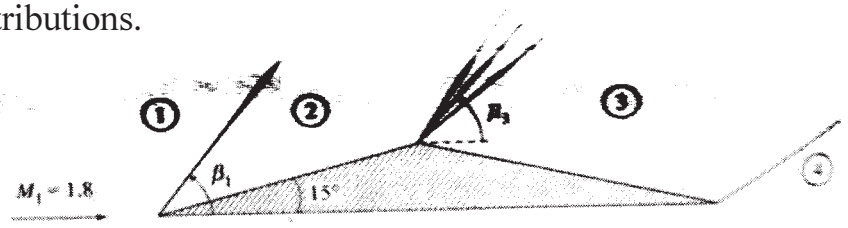


Fig. (2)

b) Explain the Prandtl-Myer expansion fan. **[4]**

Q7) a) Explain in detailed **[10]**

i) Rayleigh curve

ii) Fanno curve

b) Explain Over-expanded and under-expanded nozzles. **[8]**

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

a) Explain with neat sketch : Mach reflection.

b) Design aspect for supersonic airfoils.

c) Compressibility factor and its need.

d) Applications and existences of "shock" in real life practice.

CHART 1: Oblique Shock Chart

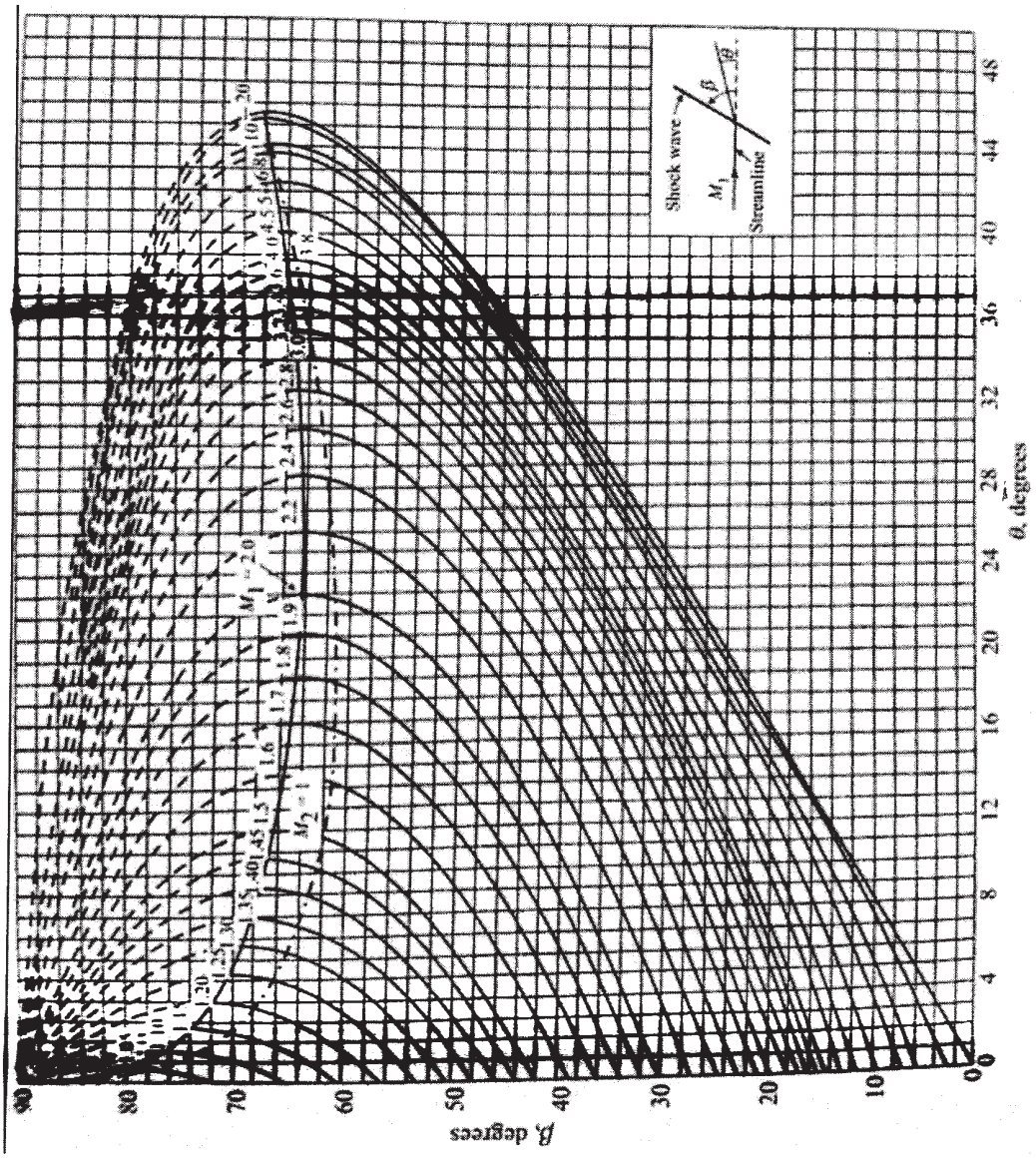


TABLE A1: Normal Shock in Perfect Gas ($\gamma = 1.4$)

M_1	M_2	p_2/p_1	T_2/T_1	ρ_2/ρ_1	p_{02}/p_{01}	p_{02}/p_1
1.36	0.757 18	1.991 20	1.229 00	1.620 18	0.967 58	2.911 52
1.38	0.748 29	2.055 13	1.241 81	1.654 94	0.963 04	2.979 80
1.40	0.739 71	2.120 00	1.254 69	1.689 65	0.958 19	3.049 23
1.42	0.731 44	2.185 80	1.267 64	1.724 30	0.953 06	3.119 80
1.68	0.645 79	3.126 13	1.444 03	2.164 86	0.863 94	4.137 90
1.70	0.640 54	3.205 00	1.458 33	2.197 72	0.855 72	4.223 83
1.72	0.635 45	3.284 80	1.472 74	2.230 40	0.847 36	4.310 83
2.12	0.558 29	5.076 79	1.787 45	2.840 24	0.664 92	6.273 50
2.14	0.555 38	5.176 19	1.804 59	2.868 34	0.655 67	6.382 68
2.16	0.552 54	5.276 53	1.821 87	2.896 21	0.646 45	6.492 90
4.45	0.424 53	22.936 33	4.787 93	4.790 45	0.095 50	25.962 70
4.50	0.423 55	23.458 42	4.875 10	4.811 88	0.091 70	26.538 76
4.60	0.421 68	24.520 12	5.052 34	4.853 22	0.084 59	27.710 22

ISENTROPIC FLOW PROPERTIES

k 1.4

M	$\frac{p_o}{p}$	$\frac{\rho_o}{\rho}$	$\frac{T_o}{T}$	$\frac{A}{A^*}$
1.010	1.9152	1.5907	1.2040	1.0001
1.020	1.9379	1.6041	1.2081	1.0003
1.030	1.9610	1.6178	1.2122	1.0007
1.040	1.9846	1.6316	1.2163	1.0013
1.050	2.0085	1.6457	1.2205	1.0020
1.060	2.0330	1.6599	1.2247	1.0029
1.070	2.0578	1.6744	1.2290	1.0039
1.080	2.0831	1.6891	1.2333	1.0051
1.090	2.1089	1.7040	1.2376	1.0064
1.100	2.1351	1.7191	1.2420	1.0079
1.110	2.1618	1.7344	1.2464	1.0095
1.120	2.1890	1.7500	1.2509	1.0113
1.130	2.2167	1.7658	1.2554	1.0132
1.140	2.2449	1.7818	1.2599	1.0153
1.150	2.2736	1.7980	1.2645	1.0175
1.160	2.3028	1.8145	1.2691	1.0198
1.170	2.3325	1.8312	1.2738	1.0222
1.180	2.3628	1.8481	1.2785	1.0248
1.190	2.3936	1.8653	1.2832	1.0276
1.200	2.4250	1.8827	1.2880	1.0304
1.210	2.4569	1.9004	1.2928	1.0334
1.220	2.4894	1.9183	1.2977	1.0366
1.230	2.5224	1.9365	1.3026	1.0398
1.240	2.5560	1.9549	1.3075	1.0432
1.250	2.5903	1.9736	1.3125	1.0468
1.260	2.6251	1.9925	1.3175	1.0504
1.270	2.6606	2.0117	1.3226	1.0542
1.280	2.6967	2.0311	1.3277	1.0581
1.290	2.7334	2.0508	1.3328	1.0621
1.300	2.7707	2.0708	1.3380	1.0663
1.310	2.8088	2.0911	1.3432	1.0706
1.320	2.8474	2.1116	1.3485	1.0750
1.330	2.8868	2.1324	1.3538	1.0796
1.340	2.9269	2.1535	1.3591	1.0842
1.350	2.9676	2.1749	1.3645	1.0890
1.360	3.0091	2.1965	1.3699	1.0940
1.370	3.0513	2.2185	1.3754	1.0990
1.380	3.0942	2.2407	1.3809	1.1042
1.390	3.1378	2.2633	1.3864	1.1095
1.400	3.1823	2.2861	1.3920	1.1149
1.410	3.2275	2.3093	1.3976	1.1205
1.420	3.2734	2.3327	1.4033	1.1262
1.430	3.3202	2.3565	1.4090	1.1320
1.440	3.3678	2.3805	1.4147	1.1379
1.450	3.4162	2.4049	1.4205	1.1440
1.460	3.4654	2.4296	1.4263	1.1501
1.470	3.5155	2.4547	1.4322	1.1565
1.480	3.5665	2.4800	1.4381	1.1629
1.490	3.6183	2.5057	1.4440	1.1695
1.500	3.6710	2.5317	1.4500	1.1762

M	$\frac{p_o}{p}$	$\frac{\rho_o}{\rho}$	$\frac{T_o}{T}$	$\frac{A}{A^*}$
1.510	3.7247	2.5581	1.4560	1.1830
1.520	3.7792	2.5848	1.4621	1.1899
1.530	3.8347	2.6119	1.4682	1.1970
1.540	3.8911	2.6392	1.4743	1.2042
1.550	3.9485	2.6670	1.4805	1.2116
1.560	4.0068	2.6951	1.4867	1.2190
1.570	4.0662	2.7235	1.4930	1.2266
1.580	4.1266	2.7524	1.4993	1.2344
1.590	4.1880	2.7816	1.5056	1.2422
1.600	4.2504	2.8111	1.5120	1.2502
1.610	4.3139	2.8411	1.5184	1.2584
1.620	4.3785	2.8714	1.5249	1.2666
1.630	4.4442	2.9021	1.5314	1.2750
1.640	4.5110	2.9332	1.5379	1.2836
1.650	4.5789	2.9646	1.5445	1.2922
1.660	4.6479	2.9965	1.5511	1.3010
1.670	4.7181	3.0288	1.5578	1.3100
1.680	4.7896	3.0614	1.5645	1.3190
1.690	4.8622	3.0945	1.5712	1.3283
1.700	4.9360	3.1280	1.5780	1.3376
1.710	5.0111	3.1619	1.5848	1.3471
1.720	5.0874	3.1962	1.5917	1.3567
1.730	5.1650	3.2310	1.5986	1.3665
1.740	5.2439	3.2662	1.6055	1.3764
1.750	5.3241	3.3018	1.6125	1.3865
1.760	5.4057	3.3378	1.6195	1.3967
1.770	5.4886	3.3743	1.6266	1.4070
1.780	5.5729	3.4113	1.6337	1.4175
1.790	5.6587	3.4487	1.6408	1.4282
1.800	5.7458	3.4865	1.6480	1.4390
1.810	5.8344	3.5248	1.6552	1.4499
1.820	5.9244	3.5636	1.6625	1.4610
1.830	6.0160	3.6029	1.6698	1.4723
1.840	6.1091	3.6426	1.6771	1.4836
1.850	6.2037	3.6828	1.6845	1.4952
1.860	6.2998	3.7235	1.6919	1.5069
1.870	6.3976	3.7647	1.6994	1.5187
1.880	6.4970	3.8063	1.7069	1.5308
1.890	6.5980	3.8485	1.7144	1.5429
1.900	6.7006	3.8912	1.7220	1.5553
1.910	6.8050	3.9344	1.7296	1.5677
1.920	6.9111	3.9781	1.7373	1.5804
1.930	7.0189	4.0223	1.7450	1.5932
1.940	7.1284	4.0671	1.7527	1.6062
1.950	7.2398	4.1124	1.7605	1.6193
1.960	7.3530	4.1582	1.7683	1.6326
1.970	7.4680	4.2045	1.7762	1.6461
1.980	7.5849	4.2514	1.7841	1.6597
1.990	7.7037	4.2989	1.7920	1.6735
2.000	7.8244	4.3469	1.8000	1.6875

Total No. of Questions : 8]

SEAT No. :

P3399

[Total No. of Pages : 3

[4660] - 127

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

ADVANCED HEAT TRANSFER

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from each Section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Draw Neat diagrams wherever necessary.***
4) ***Use of property tables and scientific calculator is allowed.***
5) ***Assume suitable data wherever necessary.***
6) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the following: **[8]**

i) Thermal contact resistance and methods to minimize thermal contact resistance.

ii) Difference between Isotropic and Anisotropic materials and examples of Anisotropic materials.

iii) Thermal diffusivity and its relation to Prandtl Number.

iv) Examples of steady state heat transfer.

b) What is the objective of defining Fin effectiveness? Two pin fins are identical, except that the diameter of one of them is twice the diameter of the other. For which fin is the fin effectiveness and fin efficiency higher. Explain. **[8]**

Q2) a) Explain the physical significance of Fourier number? Will the Fourier number for a specified heat transfer problem double when the time is doubled? **[6]**

P.T.O.

b) On a hot day the wood surface gets heated to 50° C to a considerable depth. Sudden sharp showers cool the surface to 20°C and maintain the surface at this temperature level. Determine the temperature at 2 cm depth after 40 minutes. The material properties are :

ρ=2100kg/m^3, Cp=920 J/kgK, k=0.062 W/mK. **[10]**

Also calculate the heat flow from the surface during 40 minutes and the instantaneous heat flow at the surface.

Use the following table.

Z	erf (Z)
1.12	0.8867
1.16	0.8991
1.20	0.9103
1.30	0.9340

Q3) a) How is Reynolds analogy expressed? What is the value of it? What are its limitations? **[6]**

b) Write a note on Chilton-Colburn analogy. **[4]**

c) Engine oil at 60°C flows over the upper surface of a 5 m long flat plate whose temperature is 20°C with a velocity of 2 m/s. Determine the total drag force and the rate of heat transfer per unit width of the entire plate. **[8]**

Take the properties of oil as

ρ = 876 kg/m^3, υ = 2.485 × 10^{-4} m^2/s,

k = 0.1444 W/mK and Pr = 2962

Use Nu = 0.664 Re$^{0.5}$ Pr$^{0.33}$

Q4) a) Water is heated while flowing through a 1.5 cm × 3.5 cm rectangular cross section tube at a velocity of 1.2 m/s. The entering temperature of the water is 40°C and the tube wall is maintained at 85°C. Determine the length of tube required to raise the temperature of water to 70°C. **[8]**

Take the properties of water as

ρ = 985.5 kg/m^3, Cp = 4.18 kJ/kgK, υ = 0.517 × 10^{-6} m^2/s,

k = 0.654 W/mK and Pr = 3.26.

Use Nu = 0.023 Re$^{0.8}$ Pr$^{0.4}$

b) Write a note on Heat transfer enhancement techniques. **[8]**

SECTION - II

Q5) a) Consider laminar natural convection from a vertical hot plate. Will the heat flux be higher at the top or at the bottom of the plate? Why? **[4]**

b) The maximum allowable surface temperature of an electrically heated vertical plate 15 cm high and 10 cm wide is 140°C. Estimate the maximum rate of heat dissipation from both sides of the plate in an atmosphere at 20° C. The radiation heat transfer coefficient is 8.72 W/m^2 K. Take properties of air at 80° C as **[8]**

$\upsilon = 21.09 \times 10^{-6}$ m^2/s,

k = 0.03 W/mK and Pr = 0.692

Use $Nu = 0.59 (Ra)^{1/4}$

c) Give example of Mixed convection. Which dimensionless number is used for analysis of mixed convection heat transfer? **[4]**

Q6) a) Write a note on forced convection boiling. **[8]**

b) Prove that L/D 2.86 is the relation to decide whether tubes are to be kept horizontal or vertical in a condenser. L is the length and D is the diameter of the tubes to be used in condenser. **[8]**

Q7) a) Consider a 4m × 4m × 4m cubical furnace whose floor and ceiling are black and whose side surfaces are reradiating. The floor and the ceiling of the furnace are maintained at temperatures of 550 K and 1100 K respectively. Determine the net rate of radiation heat transfer between the floor and the ceiling of the furnace. **[8]**

b) Consider an enclosure consisting of five surfaces. How many view factors does this geometry involve? How many of these view factors can be determined by the application of the reciprocity and summation rules? **[6]**

c) Explain heat transfer analysis for Multimode heat transfer. **[4]**

Q8) Write note on any two: **[16]**

a) Ablative cooling.

b) Cooling load of electronic equipment.

c) Immersion cooling.

Total No. of Questions :8]

SEAT No. :

P2718

[Total No. of Pages :2

[4660] - 128
M.E. (Mechanical - Heat Power Engg.)
MEASUREMENT TECHNIQUES & DATA ANALYSIS
(2008 Pattern) (Semester - II) (502109)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain classification of measuring instruments. **[8]**

b) Explain probable error and standard error. **[8]**

Q2) a) In a partially destroyed record the following data are available.

Variance of x = 25

Regression equation of x upon y, $5x - y = 22$

Regression equation of y upon x, $64x - 45y = 24$

Find i) mean value of x & y.

ii) co-efficient of correlation between x & y

iii) standard deviation of y. **[10]**

b) Explain different types of correlations. **[8]**

Q3) a) Find the co-efficient of correlation for the following data. **[8]**

Marks by Judge x	52	53	42	60	45	41	37	38	25	27
Marks by Judge y	65	68	43	38	77	48	35	30	25	50

P.T.O.

b) Differentiate between regression analysis & correlation analysis. **[8]**

Q4) a) Explain the method of measurement of humidity using capacitance method. **[10]**

b) Explain Beer-Lambart's law. **[6]**

SECTION - II

Q5) a) Explain the working of vortex shedding flow meter. **[8]**

b) Explain the working of infrared spectrophotometer. **[10]**

Q6) a) Explain the principle, construction & working of resistance thermal detector. **[8]**

b) Explain with a neat sketch the working of electromagnetic flow meter. **[8]**

Q7) a) Explain any one ultra low pressure measurement method. **[8]**

b) For a Mcleod gauge, with a capillary of 1mm diameter and effective bulb volume of $80cm^3$, find the reading indicated by Mercury column due to pressure of 15Pa. **[8]**

Q8) Write short notes on any four: **[16]**

a) Radiation pyrometer.

b) Noise meter.

c) Applications of spectroscopy.

d) P + I + D controller.

e) Hair hygrometer.

Total No. of Questions :8]

SEAT No. :

P3255

[Total No. of Pages :3

[4660]-129
M.E. (Mechanical- Heat Power)
ADVANCED FLUID MECHANICS
(2008 Pattern) (502110)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate answer-books.***
3) ***Draw Diagrams wherever necessary.***
4) ***Use of scientific calculator is allowed.***
5) ***Assume suitable data wherever necessary.***

SECTION -I

Q1) a) Derive a generalized expression for total derivative and deduce the same for velocity, density, temperature and pressure. **[8]**

b) $\bar{V} = (20y^2)\bar{i} - 20xy\,\bar{j}$, Determine **[8]**

i) angular velocity

ii) vorticity

iii) stream function

iv) velocity potential function. Also determine rate of flow between (1,1) and (2,2).

Q2) a) Write generalized Navier Stokes equations and deduces the expression for incompressible flow. Also obtain the expression for Bernoulli's equation of motion, mentioning the assumptions. **[8]**

b) Steel sphere of 4 mm dia. falls in glycerine at a terminal velocity of 0.04 m/s. Assuming Stokes law is applicable, determine **[8]**

i) Dynamic viscosity of glycerine

ii) Drag force, and

iii) Drag coefficient for the sphere

Take sp. wt. of steel and glycerine as 75kN/m^3 and 12.5 kN/m^3.

P.T.O.

Q3) a) Obtain exact solution of fully developed flow between fixed parallel plates. **[8]**

b) The flat plate is moving at a velocity of U= 15 m/s on top of a 15 mm thick oil film. The density of the oil is 920 kg/m^3 and dynamic viscosity, μ= 0.8 kg/m.s. Also there is a favorable pressure gradient of -4μU/h^2. Calculate the average and maximum forward velocity of the oil film, the flow rate, the force required to pull the upper plate (per m^2). 'h' is the distance between moving plate and stationary plate. Assume laminar flow between the plates. **[8]**

Q4) a) Derive an ordinary differential equation of boundary layer for wedge flows. **[10]**

b) For flow over a flat plate, the velocity profile within the boundary-layer is assumed as u = U_∞ tanh (y/δ). Show that the skin friction coefficient on the flat plate is given by **[8]**

$$\frac{\tau_w}{\rho U_\infty^2} = 0.3125\left[\frac{U_\infty x}{\nu}\right]^{-1/2}$$

SECTION -II

Q5) a) Derive an expression of boundary layer thickness in a turbulent flow on flat plate. **[10]**

b) Derive an expression for universal velocity distribution law in pipe flow. **[8]**

Q6) a) What is need of turbulence modeling? Discuss various turbulence models. **[8]**

b) Heated air at 1 atm and 35^{o}C is to be transported in a 100-m-long circular plastic duct at a rate of 0.25 m^3/s. If the head loss in the pipe is not to exceed 15 m, determine the minimum diameter of the duct. If friction factor f=0.0180 for laminar flow $f = \frac{64}{\text{Re}}$ **[8]**

for turbulent flow $\frac{1}{\sqrt{f}} = 2\log_{10}\left(\frac{R}{e}\right) + \frac{2.54}{\text{Re}\sqrt{f}}$

Q7) a) Develop area- velocity relationship in terms of Mach number and discuss effect of variation of area for subsonic, sonic and supersonic flows. **[8]**

b) Discuss the variation of mass flow rate of compressible fluid with pressure ratio. (P_2/P_1). **[8]**

Q8) a) Obtain expressions for stagnation pressure, stagnation density, and stagnation temperature in compressible flow. **[8]**

b) A normal shock wave takes place during the flow of air at a Mach number of 1.8. The static pressure and temperature of the air upstream of the shock wave are 100 kPa(abs) and 15°C. Determine the Mach number, pressure and temperature downstream of the shock. **[8]**

EEE

Total No. of Questions : 8]

SEAT No. :

P3420

[Total No. of Pages : 3

[4660]-13

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

PROJECT ECONOMICS AND FINANCIAL MANAGEMENT

(2008 Pattern)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Select between the 2 project alternatives based on the PBP, NPV at 12% and Expected IRR at 14%, based on the following cash flows. **[18]**

Year	A		B	
	Cash Inflow Rs(Lakhs)	Cash Outflow Rs (Lakhs)	Cash Inflow Rs(Lakhs)	Cash Outflow Rs(Lakhs)
0	-	500	-	400
1	300	-	100	-
2	200	-	150	50
3	100	50	200	-
4	50	-	125	100
5	50	100	75	-

P.T.O.

Q2) A construction equipment is frocured for an amount of Rs. 50,00,000. Useful life is 5 years. Salvage value is 10%. Interest rate is 5.5% on the sinking fund. Determine the annual deprication for each year by the following methods.

a) Modified straight line method as recommended by the plant and machinery committee of India. **[6]**

b) Sinking fund method. **[6]**

c) Straight line method. **[4]**

Q3) Draw the cashflow cycle for the working capital needed on a major construction project and explain the different formulae needed for estimation of cash for materials, labour, equipment and inventory. **[4 + 12 = 16]**

Q4) Explain in detail:

a) Economic and Financial feasibility of any project. **[6]**

b) Profit and loss Account Statement. **[4]**

c) Effect of risk, inflation on cash flows. **[6]**

SECTION - II

Q5) With examples from construction sector, Explain

a) JV's

b) SPV's

c) Mergers

d) Consortium

Discuss advantages and limitations of each **[18]**

Q6) A portfolio consists of

a) 3 assets in the proportion of 50:30:20 as A:B:C. If the risk-return characteristics are as given in the table, determine the combined risk as well as the return characteristic of the portfolio: **[10]**

Asset	Risk	Return
A	20%	16%
B	14%	18%
C	12%	12%

b) Explain the concepts of: **[3 + 3 = 6]**

i) Micro-finance

ii) Escrow account

Q7) Discuss merits and demerits of the following types of finance. **[4 + 4 + 4 + 4 = 16]**

a) Preference Shares

b) Debentures

c) Mutual funds

d) Cash Credit

Q8) Define correctly any 8 different and important ratios used in financial status reporting and management of company's assets/liabilities and explain the utility of each ratio. **[16]**

Total No. of Questions :8]

SEAT No. :

P2719

[Total No. of Pages :2

[4660] - 130
ME (Mechanical - Heat Power)
INTERNAL COMBUSTION ENGINES FUELS
(2008 Pattern) (Elective - III) (Semester - II) (502111-A)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the desired properties of fuels for I.C Engines? **[8]**

b) Explain fuel additives for SI and CI engines. **[8]**

Q2) a) Explain in details Gases fuels. **[8]**

b) Explain how biodiesel is produced from oil. Explain advantages and disadvantages of Biodiesel. **[8]**

Q3) a) Explain phenomenon of detonation and its effects. **[8]**

b) Differentiate between Detonation and knocking with respect to SI and CI engines. **[8]**

Q4) Write short notes on (any Three) **[18]**

a) Combustion chambers for SI engines.

b) Effect of variable on detonation.

c) Alternate fuels for IC Engines.

d) Qualities of SI and CI engine fuels.

P.T.O.

SECTION - II

Q5) a) Explain in details Combustion in CI engines. **[8]**

b) Explain Combustion chambers for CI engines. **[8]**

Q6) a) Explain different Methods of Turbochargers. **[8]**

b) Explain Supercharging of SI and CI engines and its limitations. **[8]**

Q7) a) Explain Modern trends in fuels and combustion. **[8]**

b) Explain effect of operating variables on mixture requirements for CI engines. **[8]**

Q8) Write short notes on (any Three) **[18]**

a) Transient mixture requirements.

b) Factors affecting on combustion in CI engines.

c) Factors affecting delay period.

d) Modern trends in fuel and combustion.

Total No. of Questions :8]

SEAT No. :

P2220

[Total No. of Pages :2

[4660] - 131
ME (Mechanical - Heat Power)
(b) CRYOGENIC ENGINEERING
(2008 Pattern) (Elective - III) (Semester - II) (502111)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section.***
2) ***Answer to two sections should be written in separate answer book.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of pocket calculator & different gas charts as applicable is allowed.***
6) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Define Cryogenics. What is the temperature threshold distinguishing Cryogenics from Refrigeration and Air conditioning. **[6]**

b) State important landmarks achieved in the filed of Cryogenics since its inception. **[6]**

c) State boiling points for the gases viz. Helium. Hydrogen, Argon, Nitrogen, Oxygen, Ammonia. **[6]**

Q2) a) Explain the phenomena of Super - conductivity and its principle with neat sketch. What are the different applications of Super - conductivity phenomena in present day world. **[10]**

b) Explain super - fluidity phenomena observed at Cryogenic temperatures observed in case of helium liquids. **[6]**

Q3) a) Explain the Thermodynamically ideal liquefaction system. **[8]**

b) Explain simple Linde Hampson system with neat sketch. **[8]**

P.T.O.

Q4) a) Define Joules Thompson coefficient. Explain inversion curve with neat sketch. What is the preferred joules thompson coefficient to achieve cooling. **[10]**

b) Define FOM, yield. How these parameters are different from COP and RE. **[6]**

SECTION - II

Q5) a) What is the need of Pre-cooling in Simple Linde Hampson system. **[10]**

b) Explain Cascade liquefaction system. **[8]**

Q6) a) What are the different refrigerators used below 1 K temperature explain any one. **[8]**

b) Explain the construction of Dewar vessel with neat sketch showing all the components and there function. **[8]**

Q7) a) What are the different safety devices used in Dewar vessel and there function. **[5]**

b) Explain different insulations used in the field of Cryogenics in the increasing order of performance. **[5]**

c) Explain different methods/instruments used to measure liquid level in Dewar vessel. Explain any one. **[6]**

Q8) a) State the different vacuum pumps used in the field of Cryogenics in the increasing order of vacuum achieved. Explain any one with neat sketch. **[10]**

b) Explain vacuum operating range for various a. Vacuum pumps. b. Vacuum gauges. **[6]**

Total No. of Questions : 8]

SEAT No. :

P3256

[Total No. of Pages :2

[4660]-132

M.E. (Mechanical- Heat Power)

NON-CONVENTIONAL POWER PLANT

(Elective-III) (2008 Pattern) (Semester-II) (502111C)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) What is the potential of renewable energy sources in India? Which is the most commonly used sources? **[8]**

b) What are the advantages and disadvantages of Photovoltaic solar energy conversion? **[8]**

Q2) a) What do you understand by CO_2 reduction potential of renewable energy? Explain. **[8]**

b) List various ways by which solar energy can be used to generate power. With sketch explain the working of any one type. **[8]**

Q3) a) List the various thermal energy storage methods and explain each one of them. **[8]**

b) With neat sketch explain horizontal axis and vertical axis with machines. Write down the problems in operating large wind power generators. **[8]**

P.T.O.

Q4) Write notes on: **[18]**

a) Distributed power supply strategy.

b) Energy wheeling and banking.

c) Economic analysis of a solar thermal system.

d) Renewable electricity and key elements.

SECTION-II

Q5) a) Explain with neat sketch Claude cycle for OTEC system. **[8]**

b) Explain details of tidal power plant components. **[8]**

Q6) a) List the various sources for production of biogas. Explain how to accelerate gas generation. **[8]**

b) With the help of a neat sketch explain the working of a Hydrogen-Oxygen fuel cell. Write the advantages and disadvantages of fuel cells. **[8]**

Q7) a) Write a short note on Micro-Hydro power plant. **[8]**

b) Potential of wind, tidal and biogas energy in India. **[8]**

Q8) Write notes on: **[18]**

a) Clean Development Machanisms (CDM).

b) Write in brief the environmental impacts of conventional power plants.

□□□□

Total No. of Questions : 8]

SEAT No. :

P2221

[Total No. of Pages : 6

[4660]-133

M.E. (Mechanical) Heat Power

a - HEAT EXCHANGER SYSTEM DESIGN AND PERFORMANCE

(502112) (Semester - II) (Elective - IV) (2008 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Use of Calculator is allowed.***
4) ***Use of steam table, properties table and heat transfer data book is permitted.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) A shell and tube heat exchanger is to be designed to heat 2.5kg/s of water from 15 to 85ºC. The heating is to be accomplished by passing hot engine oil, which is available at 160ºC, through the shell side of the exchanger. The oil is known to provide an average convection coefficient of h_o = 400 W/m^2.K on the outside of the tubes. Ten tubes pass the water through the shell. Each tube is thin walled, of diameter D = 25mm, and makes eight passes through the shell. If the oil leaves the exchanger at 100ºC, what is its flow rate? How long must the tubes be to accomplish the desired heating? Use NTU relations. For oil C_p = 2350 J/Kg.K. **[16]**

Q2) A heat exchanger uses hotexhaust gases to heat water from 30 to 80ºC at a rate of 3kg/s. The exhaust gases, having Thermophysical properties similar to air, enter and exit the exchanger at 225ºC and 100ºC, respectively. The overall heat transfer coefficient is 200 W/m^2.K. Consider the fluid conditions and overall heat transfer coefficient for a concentric tube heat exchanger operating in parallel flow.

The thin - walled separator tube has a diameter of 100mm. **[16]**

a) Determine the required length for the exchanger.

b) Assuming water flow inside the separator tube to be fully developed estimate.

the convection heat transfer coefficient.

[Air properties: C_p = 1019 J/Kg. K,

[Water properties : C_p = 4183 J/Kg.K, k = 0.64 W/m.K, Pr = 3.58, ρ=985 Kg/m^3, μ = 505 × 10^{-5} Ns/m^2.]

(Use DittusBoelter equation, with n = 0.4 for heating)

P.T.O.

Q3) Shell-and-tube heat exchanger consists of 135 thin walledtubes in a double-pass arrangement, each of 12.5mm diameter with a total surface area of 47.5m^2. Water (the tube-side fluid) enters the heat exchanger at 15ºC and 6.5 kg/s and is heated by exhaust gas entering at 200ºC and 5kg/s. The gas may be assumed to have the properties of atmospheric air, and the overall heat transfer coefficient is approximately 200W/m^2.K **[16]**

a) What are the gas and water outlet temperatures?

b) Assuming fully developed flow, what is the tube side convection coefficient?

(Use DittusBoelter equation, with n = 0.4)

Q4) a) Consider a concentric tube heat exchanger characterized by a uniform overall heat transfer coefficient and operating under the following conditions: **[12]**

	□ (kg/s)	C_p (J/kg.K)	T_i (ºC)	T_o (ºC)
Cold fluid	0.125	4200	40	95
Hot fluid	0.125	2100	210	---

i) What is the maximum possible heat transfer rate?

ii) What is the heat exchanger effectiveness? Should the heat exchanger be operated in parallel flow or in counter flow?

iii) What is the ratio of the required areas for these two flow conditions?

b) Explain principle of heat pipe exchanger with sketch. **[6]**

SECTION - II

Q5) a) Write a note on heat transfer coefficient on vapor side of condenser. **[8]**

b) What is tube layout? State which layout is preferred in case of **[8]**

i) Compact heat exchanger.

ii) Cleaned air flow.

iii) Air with dust.

Q6) Draw labeled sketches of following: **[18]**

a) Two dimensional temperature distributions in a single pass cross flow heat exchanger.

b) Plate fin heat exchanger with different flow arrangements.

c) Types of shells as per TEMA.

Q7) a) Discuss various methods and need for maintenance of heat exchanger. **[8]**

b) Distinguish between "flow mixed" and "flow unmixed" in the case of heat exchangers with sketch and applications. **[8]**

Q8) a) Write note on related to shell and tube heat exchanger: Number of passes tube side & shell side, tube length. **[8]**

b) Write note on effect of fin density on fouling in heat exchangers. **[8]**

TABLE 11.3 Heat Exchanger Effectiveness Relations [5]

Flow Arrangement	Relation	
Parallel flow	$\varepsilon = \dfrac{1 - \exp[-\text{NTU}(1 + C_r)]}{1 + C_r}$	
Counterflow	$\varepsilon = \dfrac{1 - \exp[-\text{NTU}(1 - C_r)]}{1 - C_r \exp[-\text{NTU}(1 - C_r)]}$	$(C_r < 1)$
	$\varepsilon = \dfrac{\text{NTU}}{1 + \text{NTU}}$	$(C_r = 1)$
Shell-and-tube		
One shell pass (2, 4, . . . tube passes)	$\varepsilon_1 = 2\left\{1 + C_r + (1 + C_r^2)^{1/2} \times \dfrac{1 + \exp[-(\text{NTU})_1(1 + C_r^2)^{1/2}]}{1 - \exp[-(\text{NTU})_1(1 + C_r^2)^{1/2}]}\right\}^{-1}$	
n shell passes ($2n$, $4n$, . . . tube passes)	$\varepsilon = \left[\left(\dfrac{1 - \varepsilon_1 C_r}{1 - \varepsilon_1}\right)^n - 1\right]\left[\left(\dfrac{1 - \varepsilon_1 C_r}{1 - \varepsilon_1}\right)^n - C_r\right]^{-1}$	
Cross-flow (single pass)		
Both fluids unmixed	$\varepsilon = 1 - \exp\left[\left(\dfrac{1}{C_r}\right)(\text{NTU})^{0.22}\{\exp[-C_r(\text{NTU})^{0.78}] - 1\}\right]$	
C_{max} (mixed), C_{min} (unmixed)	$\varepsilon = \left(\dfrac{1}{C_r}\right)(1 - \exp\{-C_r[1 - \exp(-\text{NTU})]\})$	
C_{min} (mixed), C_{max} (unmixed)	$\varepsilon = 1 - \exp(-C_r^{-1}\{1 - \exp[-C_r(\text{NTU})]\})$	
All exchangers ($C_r = 0$)	$\varepsilon = 1 - \exp(-\text{NTU})$	

TABLE 11.4 Heat Exchanger NTU Relations

Flow Arrangement	Relation	
Parallel flow	$\text{NTU} = -\dfrac{\ln[1 - \varepsilon(1 + C_r)]}{1 + C_r}$	
Counterflow	$\text{NTU} = \dfrac{1}{C_r - 1}\ln\left(\dfrac{\varepsilon - 1}{\varepsilon C_r - 1}\right)$	$(C_r < 1)$
	$\text{NTU} = \dfrac{\varepsilon}{1 - \varepsilon}$	$(C_r = 1)$
Shell-and-tube		
One shell pass (2, 4, . . . tube passes)	$(\text{NTU})_1 = -(1 + C_r^2)^{-1/2}\ln\left(\dfrac{E - 1}{E + 1}\right)$ $E = \dfrac{2/\varepsilon_1 - (1 + C_r)}{(1 + C_r^2)^{1/2}}$	
n shell passes ($2n$, $4n$, . . . tube passes)	Use Equations 11.30b and 11.30c with $\varepsilon_1 = \dfrac{F - 1}{F - C_r}$ $F = \left(\dfrac{\varepsilon C_r - 1}{\varepsilon - 1}\right)^{1/n}$ $\text{NTU} = n(\text{NTU})_1$	
Cross-flow (single pass)		
C_{max} (mixed), C_{min} (unmixed)	$\text{NTU} = -\ln\left[1 + \left(\dfrac{1}{C_r}\right)\ln(1 - \varepsilon C_r)\right]$	
C_{min} (mixed), C_{max} (unmixed)	$\text{NTU} = -\left(\dfrac{1}{C_r}\right)\ln[C_r \ln(1 - \varepsilon) + 1]$	
All exchangers ($C_r = 0$)	$\text{NTU} = -\ln(1 - \varepsilon)$	

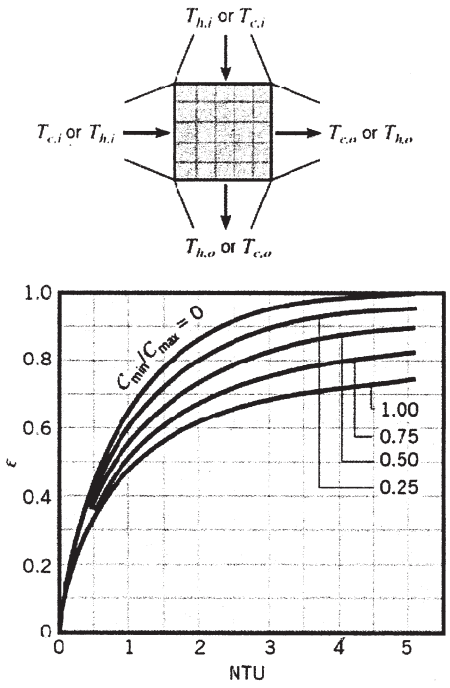


FIGURE 11.14 Effectiveness of a single-pass, cross-flow heat exchanger with both fluids unmixed (Equation 11.32).

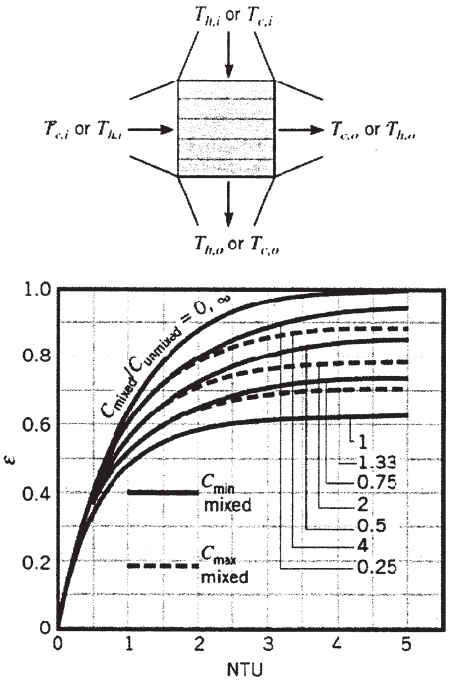


FIGURE 11.15 Effectiveness of a single-pass, cross-flow heat exchanger with one fluid mixed and the other unmixed (Equations 11.33, 11.34).

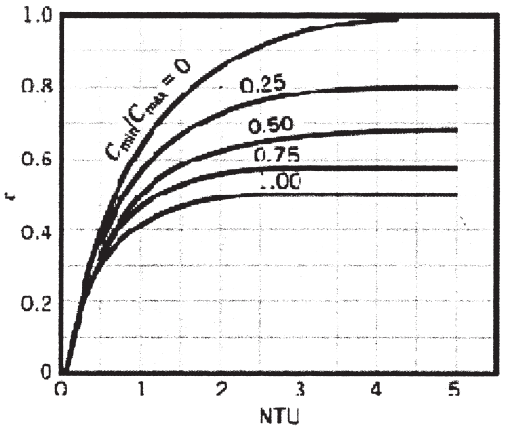


FIGURE 11.10 Effectiveness of a parallel-flow heat exchanger (Equation 11.28).

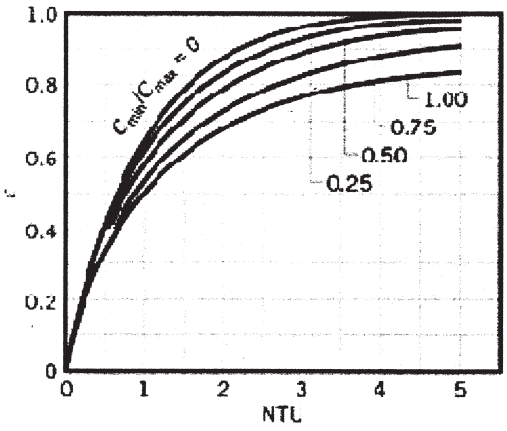


FIGURE 11.11 Effectiveness of a counterflow heat exchanger (Equation 11.29).

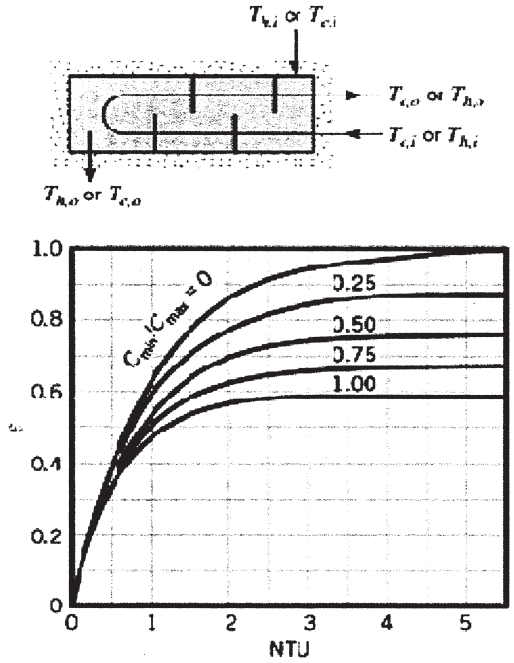


FIGURE 11.12 Effectiveness of a shell-and-tube heat exchanger with one shell and any multiple of two tube passes (two, four, etc., tube passes) (Equation 11.30).

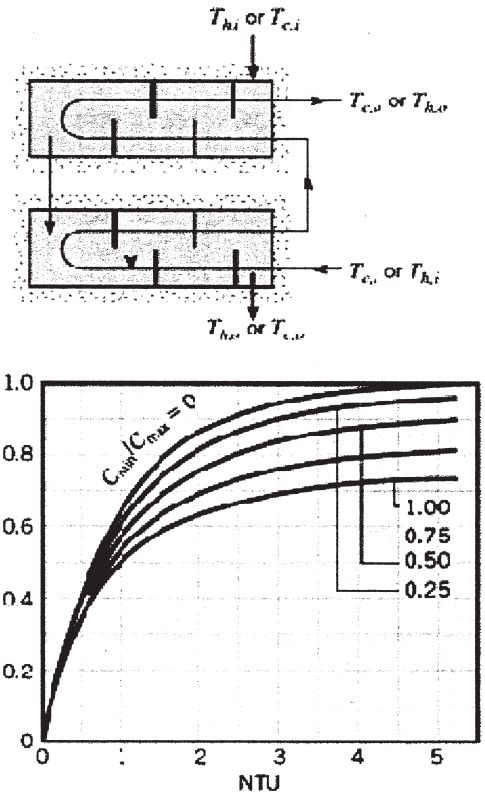


FIGURE 11.13 Effectiveness of a shell-and-tube heat exchanger with two shell passes and any multiple of four tube passes (four, eight, etc., tube passes) (Equation 11.31 with $n = 2$).

Total No. of Questions : 8]

SEAT No. :

P3487

[Total No. of Pages : 3

[4660] - 134

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

COMPUTATIONAL FLUID DYNAMICS

(2008 Pattern) (Elective - IV)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Derive the momentum equation in differential form for 2D flow in conservation form. Draw a neat diagram and explain the selected control volume for the derivation. **[12]**

b) Classify the PDE's in different forms. Give one practical example of each type. **[6]**

Q2) a) What is finite difference method? Derive an expression for forward, backward and central difference equations using Taylor series expansion. **[10]**

b) What is a stability criterion of a numerical scheme? Explain in detail. **[6]**

Q3) a) Solve the system of equations given below in matrix form **[10]**

$$\begin{pmatrix} 3000 & -1000 & 0 & 0 \\ -1000 & 2000 & -1000 & 0 \\ 0 & -1000 & 2000 & -1000 \\ 0 & 0 & -1000 & 3000 \end{pmatrix} \begin{pmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \end{pmatrix} = \begin{pmatrix} 2000T_A + 2500 \\ 2500 \\ 2500 \\ 2000T_B + 2500 \end{pmatrix}$$

P.T.O.

Take T_A = 100°C and T_B = 400° C. Find the values of temperatures T_1, T_2, T_3 and T_4 using TDMA method.

b) What is numerical dissipation? Explain in detail. **[6]**

Q4) a) Discuss the Dirichlet, Neumann and Robin boundary conditions. Give suitable examples of each. **[8]**

b) Illustrate the use of CFD in any of the following *two* areas with suitable examples. **[8]**

i) Centrifugal Pumps

ii) HVAC

iii) Casting process in manufacturing

iv) Reentry vehicles

SECTION - II

Q5) a) What is boundary fitted grid? Explain with neat sketch. Derive and explain the transformations used to cast the two-dimensional boundary fitted grids into a uniform grid **[10]**

$$\frac{\partial}{\partial x}, \frac{\partial}{\partial y} \& \frac{\partial}{\partial t}$$

Use intrinsic co-ordinate system ξ, η and τ corresponding to x, y and t.

b) Explain use of Simple algorithm for solution of Navier Stokes equations in two dimensional flows. **[8]**

Q6) a) Write Euler's equation and explain each term. Discretize following equation **[10]**

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

Using

i) Lax-wendroff scheme and

ii) MacCormack scheme

b) Write in detail first order upwind scheme. **[6]**

Q7) a) Discuss in detail the CFD analysis process to analyze the flow over a flat plate. Highlight the three important aspects of CFD process in detail. **[8]**

b) Write in detail with neat sketches Prandtl-Meyer Expansion wave. **[8]**

Q8) Write in detail on any two topics : **[16]**

a) Couette Flow

b) Implicit methods

c) Unstructured grid

● ● ●

Total No. of Questions : 10]

SEAT No. :

P3486

[Total No. of Pages : 2

[4660] - 135

M.E. (Mechanical) (Heat Power)

COMPUTER AIDED ENGINEERING

(Elective - IV) (2008 Pattern)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Discuss thermal analysis steps applied to engine data. **[10]**

b) Explain the role of CAE in system design. **[6]**

Q2) a) Explain feature based modeling features available in commercial modeling software and explain any one in ideal. **[8]**

b) Explain how to reduce ideal time of modeling and analysis of a system using CAD/CAM/CAE software. **[8]**

Q3) a) Classify solid modeling techniques and explain in detail hybrid solid modeling technique. **[8]**

b) Discuss the set of issues that need to be addressed during development of conceptual model for analysis. **[8]**

Q4) a) Explain briefly effect of mesh density and biasing in critical regions of meshing. **[8]**

b) Explain different types of grids used in CFD. **[8]**

Q5) Write short note on

a) Numerical methods used in FEA. **[6]**

b) Bottom up assembly modeling approaches. **[6]**

c) Analytical techniques for structural systems. **[6]**

P.T.O.

SECTION - II

Q6) a) Describe briefly need and motivation of CFD. **[8]**

b) Describe role of simulation in CAE. **[8]**

Q7) a) Discuss briefly general consideration used during mesh generation related to discretization and generation of finite element data. **[8]**

b) Classify 3D meshing techniques of FEA and explain any one in detail. **[8]**

Q8) a) Enlist different ways to apply force and moment in FEA and explain any one in detail with suitable example. **[8]**

b) Explain methods to improve quality of poor element. **[8]**

Q9) a) Explain finite difference method used in CFD and how it is different from FEM. **[8]**

b) Explain different types of grids in CFD. **[8]**

Q10) Write short notes on

a) Difference between static and dynamic analysis. **[6]**

b) Methods to improve quality of poor elements in FEA. **[6]**

c) Stages of CFD Analysis. **[6]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P2222

[Total No. of Pages : 4

[4660]-136

M.E. (Mechanical) (Design Engineering & Automotive Engg.)
MATHEMATICAL MODELING AND ANALYSIS
(Revised 2008 Pattern) (Semester - I) (502201)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Write Short Notes on (Any Three): **[18]**

a) Cause Variables and Effect Variables.

b) Signal Flow Graphs.

c) Continuous Time and Discrete Time Signals.

d) Static and Dynamic Systems.

Q2) a) For the matrix $A=\begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix}$ find A^k. **[6]**

b) Construct signal flow graph for the simultaneous equations, **[10]**

$x_1 = a_{11}\, x_1 + a_{12}\, x_2 + b_1\, u_1$

$x_2 = a_{21}\, x_1 + a_{22}\, x_2 + b_2\, u_2$

Find overall gain using Mason's gain formula.

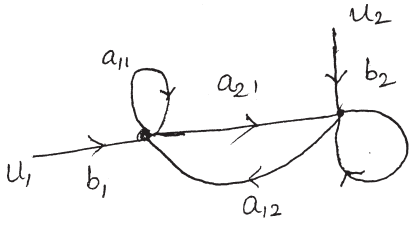


Figure Q.2 (b)

P.T.O.

Q3) a) Consider the mechanical system shown in figure 3(a). A force $f(t)$ is applied to mass M_2. The free-body diagrams for the two masses are shown in Figure 3(b). Obtain the state-Variable Formulation of the system. **[8]**

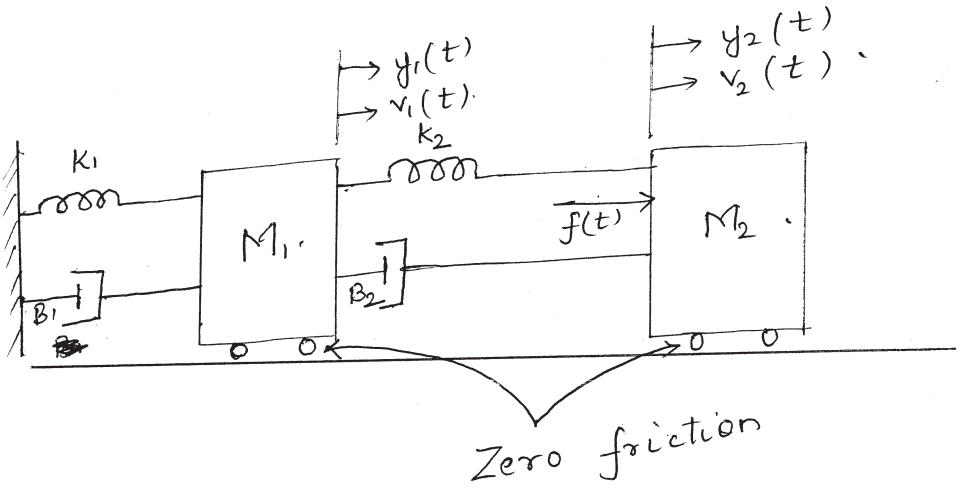


Fig 3 (a) A mechanical System

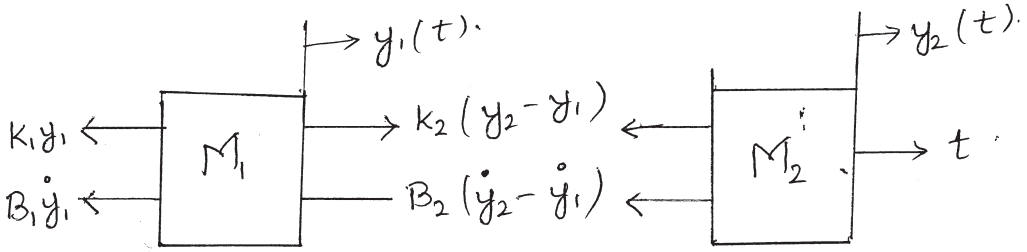


Fig 3 (b) Free - Body Diagram

b) Find e^{At} for $A = \begin{bmatrix} -2 & 1 \\ 1 & -2 \end{bmatrix}$ **[8]**

Q4) a) Consider a continuous time Linear Time Invariant (LTI) system with system function **[8]**

$$H(s) = \frac{3s + 7}{(s+1)(s+2)(s+5)}$$

Obtain a state representation of the system.

b) Draw the simulation diagram for the above part 4(a) and obtain the system matrix as a diagonal matrix. **[8]**

Q5) a) Consider a mechanical system shown in the figure 5(a). It consists of a block of mass m connected to a wall by a spring. Let k_1 be the spring constant and k_2 be the viscous friction coefficient. Let the output $y(t)$ be the displacement of the block and the input $x(t)$ be the applied force. Find a state space representation of the system. **[8]**

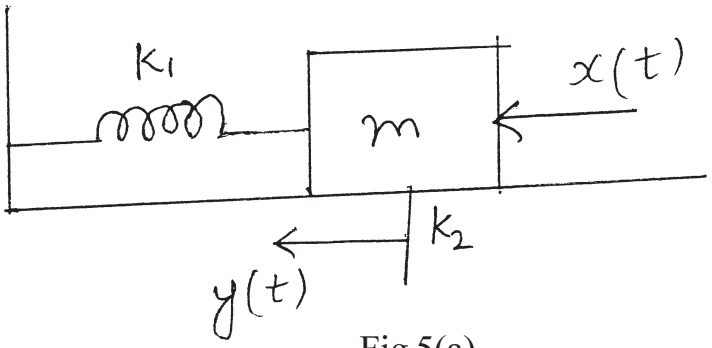


Fig 5(a)

b) Discuss linear graph models. **[8]**

SECTION - II

Q6) For the transformed equation **[18]**

$$C(s)=\frac{10F(s)-10(s+2)U(s)}{s^2+8s+15}$$

Determine the response when

a) $F(s)$ is unit step and $U(s) = 0$.

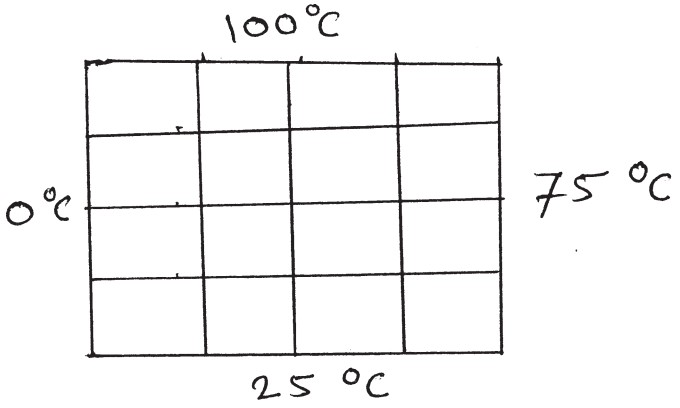
b) $F(s) = 0$ and $U(s)$ is unit step.

Q7) a) Determine the z transform of $F(s)=\frac{1}{s+2}$ using Residue method. **[8]**

b) The z transform of a digital control system is $C(z)=z\cdot\frac{z+2}{(z-0.5)(z-1)}$

Determine inverse z - transform. **[8]**

Q8) Figure shows a square plate. The temp of the edges is as shown in Figure Q8. Using Laplace equation $\frac{\partial^2 T}{\partial x^2}+\frac{\partial^2 T}{\partial y^2}=0$ and Libmann's method obtain temperatures of inside nodes. Compute four iterations and tabulate the result.



[16]

Figure Q8

Q9) For $y = f(x) = 3x^2 + 2x + 5$, from $x = 1$ to $x = 4$, using fourth order Runge Kutta (RK) method evaluate the integral with $h = 1.5$. **[16]**

Q10)a) Compare Over relaxation with Under relaxation employed in solving elliptic differential equation. **[6]**

b) Determine solution of the differential equation using Laplace Transform method $(D^3 + 4D^2 + 5D + 2)y(t) = f(t)$, **[10]**

where $f(t) = \sin(\omega t)$ and all initial conditions are zero.

Total No. of Questions : 8]

SEAT No. :

P3443

[Total No. of Pages : 3

[4660] - 139

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

INSTRUMENTATION AND AUTOMATIC CONTROL (Elective - I)

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the probable error and standard error. **[8]**

b) Explain properties of correlation coefficient. **[8]**

Q2) a) The following table gives the distribution of items of production and also the relatively defective items amongst them, according to size groups. Find the correlation coefficient between size and defect in quality and its probable error. **[12]**

Size Group	15-16	16-17	17-18	18-19	19-20	20-21
No. of Items	200	270	340	360	400	300
No. of Defective Items	150	162	170	180	180	114

b) Explain with a neat sketch working of hot wire anemometer. **[6]**

P.T.O.

Q3) a) For certain X and Y series which are correlated the two lines of regression equations are **[10]**

$$5x - 6y + 90 = 0$$

$$15x - 8y - 230 = 0$$

Find the means of two series and correlations coefficients.

b) Describe with respect to construction, working and applications any one device for humidity measurement. **[6]**

Q4) a) A platinum thermometer has a resistance of 200 Ohm at 3250C **[8]**

i) Find its resistance at 65°C if the Platinum has a resistance temperature coefficient of 0.00392°C.

ii) If the thermometer has a resistance of 150 ohm, find the temperature.

b) Explain with respect to construction, working and applications of Electromagnetic flow meter. **[8]**

SECTION - II

Q5) a) Explain the terms with reference to sound : **[8]**

i) Decibel

ii) Sound Pressure Level

iii) Sound Power Level

b) If the pressure of sound measured at 1 m from an un-muffled engine was found to be 150N/m^2, find the corresponding sound pressure level in decibels, take reference pressure = 0.002 micro-bar. **[8]**

Q6) a) Explain any one method of measurement of ultra-low pressure. **[8]**

b) Explain the principle and working of double beam spectrophotometer. **[8]**

Q7) a) Explain pneumatic PID controller. **[8]**

b) Explain a device to measure torque with respect to construction, working and applications. **[8]**

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

a) Piezoelectric accelerometer

b) Laser Doppler Anemometer

c) Chromatograph

d) Mass Spectrometry

e) Calibration of thermocouples

Total No. of Questions :8]

SEAT No. :

P2739

[Total No. of Pages :4

[4660] - 14
M.E. (Civil - Construction and Management)
OPERATION RESEARCH
(2008 Pattern) (Semester - II) (501110)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Write a detailed note on "Operation Research" with the help of following points: **[8]**

i) Definition.

ii) Scope of Operation Research in civil engineering.

iii) Application of various Operation Research techniques.

iv) Types of Operation Research models.

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

Maximize, $Z = 4x_1 + 5x_2$

Subject to, $2x_1 + 3x_2 \leq 6$

$3x_1 + x_2 \geq 3$

$x_1, x_2 \geq 0$

Q2) a) Maximize, $Z = 2x_1 + x_2$

Subject to, $3x_1 + x_2 \leq 300$

$x_1 + x_2 \leq 200$

$x_1, x_2 \geq 0$ **[8]**

P.T.O.

b) Solve by Big M Method.

$$Z = 3x_1 + 5x_2$$

Subject to, $x_1 + x_2 \geq 2$

$$x_2 \leq 6$$

$$3x_1 + 2x_2 = 18$$

$$x_1, x_2 \geq 0$$ **[8]**

Q3) a) Describe a transportation model and assignment model. How is the assignment model is differs from transportation model? Give applications of each. **[7]**

b) A department has 5 employees with 5 jobs to be performed. The time in hours each man will take to perform each job is as follows: **[9]**

	EMPLOYEES				
JOBS	**1**	**2**	**3**	**4**	**5**
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

Find the optimum allocation policy which will minimize the time.

Q4) a) Stone metal is to be transported from 4quarries to 4 construction sites. Quantity available and the unit cost of transportation are given in the table. **[9]**

	D1	**D2**	**D3**	**D4**	**a**
S1	8	10	6	2	300
S2	12	14	5	3	200
S3	10	11	7	5	140
S4	9	10	8	6	120
b	240	200	180	160	780

Determine the transportation policy which will minimize the total cost of transportation by: i) North-West method

ii) Least cost method.

iii) Vogel's Approximation method.

b) Locate the stationary points of the function f(x) and classify them as relative maxima, relative minima. **[9]**

$$f(x) = 2\frac{x_1^3}{3} - 2x_1x_2 - 5x_1 + 2x_2^2 + 4x_2 + 5$$

SECTION - II

Q5) a) Solve by using lagrange's multiplier method: **[8]**

$$f(x) = \frac{18}{x_1x_2}$$

Subject to, $x_1^2 + x_2^2 = 9$

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

Q6) a) What do you understand by simulation? What are its advantages and disadvantages? Explain Monte-Carlo simulation. **[8]**

b) Write a short note on Queuing theory? **[4]**

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

Q7) a) Following data pertains to two projects. **[8]**

	Project A	Project B	Project C
Investment	30 lakhs	30 lakhs	32 lakhs
Annual Benefits	6 lakhs	5 lakhs	7 lakhs
Useful Life	10 years	15 years	14 years
Interest Rate	8%	8%	8%

Discuss the choice of the project and rank them based on B/C ratio and NPV.

b) For the given game below, determine the optimal strategies for A

		B	
		I	II
A	I	4	2
	II	3	8
	III	2	12

i) Reduce th size of the game to 2*2 matrix. **[4]**

ii) Determine the optimal strategies for A. **[2]**

iii) Calculate the optimal value of the game. **[2]**

Q8) a) A firm considering replacement of soil compaction, machine, where cost price is Rs. 12000/- and scrap value is Rs.200/-. The running (maintenance and operating) cost is found from experience to be as follows: **[8]**

Year	1	2	3	4	5	6	7	8
Running Cost(Rs.)	200	500	800	1200	1800	2500	3200	4000

When should be the machine be replaced?

b) A sample of 200 arrivals of customers in a super market is according to following distribution. **[10]**

Time between arrivals in min.	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5
Frequency	4	12	22	48	38	28	22	12	8	4	2

The time taken for service follows the distribution.

Time in min.	0.5	1	1.5	2	2.5	3	3.5	4
Frequency	12	18	38	60	32	16	14	10

Estimate the average % waiting time and idle time of a customer by simulation for next 10 arrivals. Use the following random numbers.

Arrivals : 09, 73, 25, 33, 76, 53, 01, 35, 86, 34

Service: 54, 20, 48, 05, 64, 89, 47, 42, 96, 24.

Total No. of Questions : 10]

SEAT No. :

P3257

[Total No. of Pages : 3

[4660]-140
M.E. (Mechanical) (Design Engg.)
b-ADVANCED MATERIAL SCIENCE
(502204) (2008 Course) (Semester-I) (Elective-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Determine the relation between the lattice parameter (a) and the atomic radius (r) for monotonic, SC, BCC and FCC structure. **[8]**

b) Describe the various imperfections in crystals and their effects on properties. What is Schottky and Frenkel defect? **[8]**

Q2) a) Explain the term 'Dendritic solidification". Show how certain mechanical properties of cast metal can be explained by reference to this type of crystal structure? **[8]**

b) What do you mean by allotropic and polymorphic transformation? Explain the significance of crystallographic direction with suitable example. **[8]**

Q3) a) Explain the method of plotting an equilibrium diagram and derive the lever rule as applied to it. **[8]**

b) Explain with sketch only steel portion of Fe-C diagram with various reactions. **[8]**

P.T.O.

Q4) a) Explain the age hardening with the help of typical equilibrium diagram? How it is achieved in non ferrous materials? **[8]**

b) Explain spheroidizing annealing process used in heat treatment of tool steel. **[8]**

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

a) Dual phased steel.

b) Inconels and Haste alloys.

c) Creep resistant materials.

d) Ni alloys.

SECTION-II

Q6) a) Discuss mechanical, chemical, physical and biological requirements of orthopedic biomaterials. **[8]**

b) What is super conducting materials? How they are produced? What are its applications? **[8]**

Q7) a) Explain how the volume of the fibre, fibre orientation and fibre strength are related to each other? **[8]**

b) Determine the use of cermets in cutting tools for machining. **[8]**

Q8) a) Silicon carbide particles are compacted and fired at a high temperature to produce a strong ceramic shape. The specific gravity of SiC is 3.2 g/cm^3. The ceramic shape subsequently is weighed when dry is 360 gm, after soaking in water is 385 gram and while suspended in water is 224 gram. Calculate the apparent porocity, the true porocity, and fraction of the pore volume that is closed. **[8]**

b) Explain the meaning of the following terms: **[8]**

Ceramics, inorganic glass, glass-ceramics, cermets. Explain why ceramics typically are processed as powders. How is this similar or different from the processing of metals?

Q9) a) Explain the process of surface coating by vapor deposition. **[8]**

b) What is PVD? Explain the process in detail mentioning its advantages, limitations, and applications. **[8]**

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

a) Shape Memory Alloys.

b) Prosthetic materials.

c) CVD.

d) Sports materials.

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Total No. of Questions : 10]

SEAT No. :

P2223

[Total No. of Pages : 3

[4660]-142

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

MATERIAL HANDLING AND EQUIPMENT DESIGN

(502205(A)) (Elective - II) (2008 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) List the different Material handling principles & Explain any 3 in detail with suitable example. **[10]**

b) Discuss objectives of material handling system. How it can be achieved? **[6]**

Q2) a) Explain how Plant Layout affects the selection of Material handling system? **[8]**

b) State the different limitations of MHS. Suggest how it can be overcome effectively? **[8]**

Q3) a) Explain Hoisting Gear Operation. **[8]**

b) Explain Activity cost data & economic analysis for design of components of MHS. **[10]**

Q4) a) Explain General design considerations for designing Hoists & Cranes, with importance of Material Selection in it. **[8]**

b) Discuss Stability issues in Cranes. **[8]**

P.T.O.

Q5) Write short notes (Any Four): **[16]**

a) Packing & Storage of Material.

b) Hand Propelled overhead Traveling cranes.

c) Techniques for determining Manpower Cost.

d) Traveling Mechanisms for cantilever cranes.

e) Motor rating & Breaking torque in Hoisting Mechanism.

SECTION - II

Q6) a) Explain different types of load chains & Ropes used in MHS with suitable specific individual application. **[8]**

b) Explain Design Criterion for Forged Hook. **[8]**

Q7) a) Differentiate between standard hook & ramshorm hook. **[6]**

b) Which type of MHS required for liquid material? Explain with suitable examples. **[10]**

Q8) a) Give suitable conveyor choice for following Applications (Any Five): **[10]**

i) Plastic Bottles.

ii) Small Tin cans.

iii) Automobile chassis.

iv) Cement Industry.

v) Alloy Wheels.

vi) Packing Boxes (Medium size).

b) What is concept of bulk material handling. **[8]**

Q9) a) State factors to be considered while Warehouse automation. **[8]**

b) Explain need of Mechanization in MHS. **[8]**

Q10) Write short notes (Any Four): **[16]**

a) Safety regulations in MHS.

b) Bucket Elevator.

c) Crane grabs & Clamps.

d) Overhead Traveling Cranes.

e) Monorail Cranes.

Total No. of Questions : 10]

SEAT No. :

P2224

[Total No. of Pages : 3

[4660]-143

M.E. (Mechanical Design Engg.)

b - PROCESS EQUIPMENT DESIGN

(Elective - II) (2008 Course) (502205) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the following terms with suitable examples - Design Loading, Design pressure, Stress corrosion, Dilation of pressure Vessel. **[8]**

b) Calculate the thickness of torispherical head for a vessel having internal diameter of 5000mm. Design pressure is 3.0 kg/mm^2, Knuckle radius and crown radius are 350mm and 5000mm. Permissible stress is 1000 kg/mm^2. Welded joint efficiency is 80%. **[8]**

Q2) a) Suggest a suitable material with justification for handling of any two of the following: **[4]**

i) Milk and Milk products.

ii) Chlorine.

iii) Acetic acid.

b) Explain the following aspects in Design of storage vessels. **[8]**

i) Shell thickness,

ii) Wind Girders for open top tank,

iii) Roof Curb Angle,

iv) Stresses in cone roof.

c) List the testing and inspection process used in high pressure vessels.**[4]**

P.T.O.

Q3) a) What is a bolting chair? Give design considerations for centered chair design. **[6]**

b) What are Hortonspheres. **[2]**

c) Explain role dead weight, wind load, seismic load in skirt support design. **[8]**

Q4) a) Explain need and design of reinforcement for nozzles. **[6]**

b) A cylindrical storage tank has diameter 40m and the tank height is 20m. Liquid stored in the tank has a density 800 kg/m^3. Material of construction C.S. having permissible stress 1200 kg/cm^2. Density of material used for fabrication is 7500 kg/m^3. The plate of size 3.3m × 1.8m in varying thickness is available for fabrication. Welded joint efficiency is 80% corrosion allowance is not necessary.

Calculate the cylindrical shell thickness of the tank at different heights. Also estimate the total number of plates required. **[10]**

Q5) Write Short Notes on the following (Any 3): **[18]**

a) Optimization Techniques in P.E.D.

b) I.S. Standards used for design of pressure vessels.

c) Linings for chemical plants.

d) Corrosion in process Equipments.

e) Autofrettage.

f) Protective Coatings.

SECTION - II

Q6) a) Explain in brief: **[10]**

i) Code practices.

ii) Selection and

iii) Specification procedures used in process equipment design.

b) Explain thermal stresses & its determination. **[6]**

Q7) a) What are centrifuges? Explain design consideration of centrifuges. **[8]**

b) Explain with neat sketch various expansions provisions arrangements in heat exchanger. **[8]**

Q8) a) Explain types of valves used on pipe line. **[8]**

b) A tall column 3m in diameter and 30m in height is subjected to bending moment of 302060 kg-m at the base. The weight to use with this moment for anchor bolt size is 66000 kg. Bolt circle diameter is 2.7m. The permissible stress in bolt material is 1200 kg/cm^2. Anchor bolt diameter is 40 mm. Estimate number of anchor bolts. **[8]**

Q9) a) Explain inspection and errection of process equipment of chimneys. **[8]**

b) Discuss fundamentals of process measurements and control of modern control devices. **[8]**

Q10) Write short note for following (Any three): **[18]**

a) Process coatings for process equipments.

b) Theories of failure.

c) Design of storage vessels.

d) Use of CAD to process equipment design.

Total No. of Questions : 10]

SEAT No. :

P3299

[Total No. of Pages : 3

[4660] - 144

M.E. (Mechanical - Design Engineering)

ROBOTICS

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three from each section.***
2) ***Scientific calculator is allowed.***

SECTION - I

Q1) a) Explain anatomy of Robotic System, also explain following terms: **[8]**

i) Work Volume.

ii) Spatial Resolution.

iii) Precission.

iv) Accuracy.

b) Explain working of point to point Robot and continuous path Robot. **[8]**

Q2) a) Explain principle of Hartenberg and Denavit. **[8]**

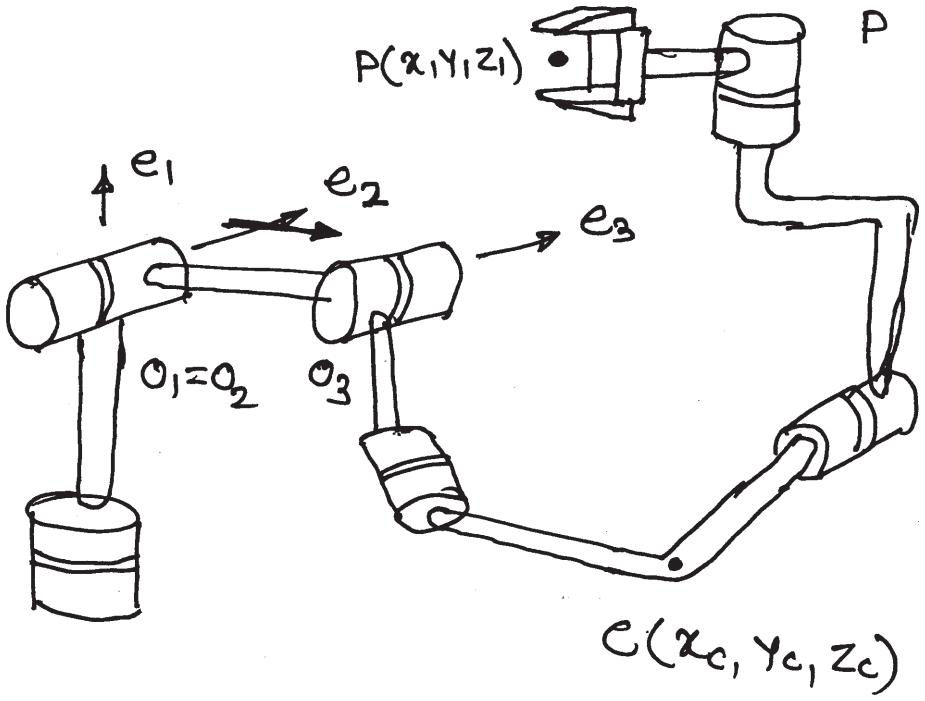
b) A co-ordinate frame X_1 Y_1 & Z_1 is rotated into a configuration X_1, Y_2, Z_2 in such a way that $X_1 = -X_1$, $Y_2 = Z_1$, $Z_2 = -X_1$ find matrix representation of rotation in X_1 Y_1 Z_1 co-ordinates from this representation compute direction of axis and angle of rotation. **[8]**

Q3) a) A manipulator with common orthogonal architecture is displayed in figure in an arbitrary configuration The arm architecture of this manipulator has DH parameters as below, **[12]**

$a_1 = a_3 = 0$, $b_1 = b_2 = b_3 = 0$, $\alpha_1 = 90^\circ$, $\alpha_2 = 0^\circ$.

Find its inverse kinematic solutions.

P.T.O.



b) Explain term Euler's angle pertainy to rigid bodies. **[4]**

Q4) a) Explain terms: **[8]**

i) Point to point trajectory planning.

ii) Continuous path trajectory planning.

b) Write a note on programming Languages of Robot. **[8]**

Q5) a) Perform following transformations on **[6]**
Point (25, 10, 20)
Trans (8, 5, 10)
Rot (45, 0, 0).

b) List down four common Robot configurations and explain with neat sketch. **[12]**

SECTION - II

Q6) a) Brief on working of potentiometer and inductive sensors for Robotics. **[8]**

b) Explain working of optical encoders. **[8]**

Q7) a) Explain role of μ-controller in Robotic systems and also comment on μ-controller bit width & sampling time. **[8]**

b) Explain working of H-bridge drives for DC motors. **[8]**

Q8) a) Explain different types of vision systems used in Robotics. **[8]**

b) Differentiate between High level & Low level machine vision system. **[8]**

Q9) a) Brief on three level of robot programming. **[8]**

b) List internal state sensors and explain its functioning with sketch. **[8]**

Q10) a) Write a note on capabilities and limitations of lead through method of programming. **[6]**

b) List the types of end effectors and illustrate with sketches. **[6]**

c) Write the notation scheme for designing robot configuration and illustrate with simple sketches. **[6]**

Total No. of Questions : 10]

SEAT No. :

P3300

[Total No. of Pages : 3

[4660] - 145

M.E. (Mechanical) (Design Engineering)

VIBRATIONS AND NOISE CONTROL

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) A steel shaft of diameter 10cm is carrying three masses 2.5kg, 3.75kg and 7kg respectively. As shown in Fig. 1. **[16]**

The distance between the rotors are 0.70m. Determine the natural frequency of torsional vibrations. The radii of gyration of three rotors are 0.20, 0.30 and 0.40m respectively. Take $G = 9 \times 10^8$ N/m^2.

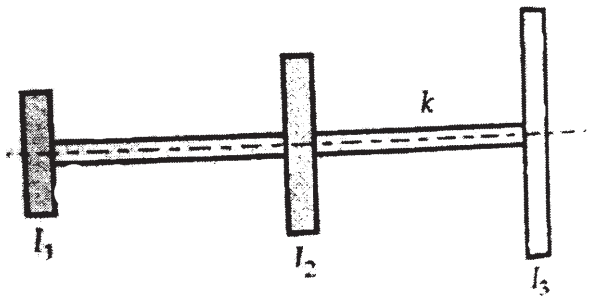


Fig.1

Q2) Using Holzer method find the natural frequency of the system shown in Fig. 2. Assume $k_1 = k_2 = 1$, $k_3 = 3$, $m_1 = 1$, $m_2 = 2$, $m_3 = 4$. **[16]**

P.T.O.

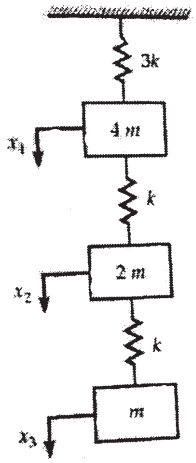


Fig.2

Q3) A bar fixed at one end is pulled at the other end with a force P. The force is suddenly released. Investigate the vibration of the bar. **[16]**

Q4) A force F(t) is suddenly applied to a mass m which is supported by a spring with a constant stiffness k. After a short period of time T, the force is suddenly removed. During the time the force is active, it is constant, F. Determine the response of the system if t>T. The spring and mass are initially at rest before the force F(t) is applied. **[16]**

Q5) Analyze undamped dynamic vibration absorber and show frequency response for main system and absorber system. **[18]**

SECTION - II

Q6) a) Explain how time domain and frequency domain techniques are used for condition monitoring. **[8]**

b) Explain FFT analyser with a block diagram. **[8]**

Q7) A non-linear spring for a single degree of freedom system is given by $k(x) = 10x + 2000x^3$. Damping coefficient for viscous damping is 1.5 kg-sec/cm. a harmonic force 5N acts on the mass of 1kg. Find the steady state response of system. **[16]**

Q8) a) Derive an expression for the spectral density of a derived process. **[8]**

b) Give three examples of random input. How will you proceed to find their Spectral Density? **[8]**

Calculate the Autocorrelation function corresponding to the ideal white noise and to the unit step function.

Q9) a) Explain with neat diagram the working of human hearing mechanism. **[6]**

b) Explain in brief the following terms: **[4]**

i) Sound power level.

ii) Sound pressure level.

iii) Sound absorption coefficient.

iv) Acoustic intensity.

c) Add the noise of six machines, which individually make a noise level of 78, 81, 81, 79, 72 and 65 dB respectively. **[6]**

Q10) Write the short notes of the following (any three): **[18]**

a) Jump Phenomenon.

b) Experimental modal analysis.

c) Ambient emission noise standards in India.

d) Wide band and narrow band process.

Total No. of Questions : 10]

SEAT No. :

P2225

[Total No. of Pages : 3

[4660]-146

M.E. (Mechanical - Design Engineering)

ADVANCED MACHINE DESIGN

(2008 Pattern) (502209) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the procedure to estimate the life of member subjected to creep. **[6]**

b) For an alloy steel the following creep rate is observed at 700ºC. **[10]**

stress σ_1 = 21 MPa; creep rate = 0.128% per 1000 Hrs.

stress σ_2 = 28 MPa; creep rate = 0.64% per 1000 Hrs.

Determine the creep rate per 1000 hours for stress value of 15MPa by using both exponential & hyperbolic laws of creep. Which of the two methods a designer will prefer?

Q2) a) Derive an expression for maximum space efficiency of helical springs. **[8]**

b) Explain the characteristics of belleville spring. State its applications. What is the effect of residual stresses in these springs. **[8]**

Q3) a) What is difference between design for finite & infinite life problems? Explain modified Goodman diagram. **[8]**

b) The work cycle of mechanical component subjected to completely reversed bending stress consists of following three elements. **[8]**

i) $\pm$ 350 N/mm^2 for 85% of time.
ii) $\pm$ 400 N/mm^2 for 12% of time and
iii) $\pm$ 500 N/mm^2 for 3% of time.

The material for component is $50C_4$(S_{ut} = 660 N/mm^2) and the corrected endurance limit of the component is 280N/mm^2. Determine life of the component.

P.T.O.

Q4) a) Explain the use of composite material in mechanical engineering giving examples of such use, state reasons for a preference in favour of such materials. **[6]**

b) A unidirectionally reinforced composite of 'Toray' filament & 'Nameo' resin has the following moduli and Poisson's ratio. **[10]**

E_{XX} = 181 GPa; E_{YY} = 10.3 GPa; υ_{XY} = 0.0159

G_{XY} = 7.17 GPa; $\left(1-\nu_{XY}\nu_{YX}\right)^{-1}=1.045$

Estimate the components of moduli for an off-axis orientation of,

i) θ = + 30° and

ii) θ = + 45°

Q5) Wrtie short note on the following: **[18]**

a) Regression analysis.

b) Hybrid materials and applications.

c) Vibration & Surging of helical springs.

SECTION - II

Q6) a) How do you identify the optimum solution in the simplex method. **[6]**

b) Formulate the problem of minimum weight design of a helical spring under axial load as a geometric programming problem. Consider constraints on the shear stress, natural frequency and buckling of the spring. **[10]**

Q7) a) Explain the term peaking & topping as applied to gear. **[6]**

b) Two 20° full depth gear of 20 and 30 teeth are to be designed on the extended centre distance system using the recommended values for clearance F = $0.25/P_d$. Make the calculations for P_d = 1. **[10]**

Find the following:

i) Values for q_1 and q_2.

ii) The actual angle ϕ.

iii) The radius of actual pitch circle and centre distance.

iv) The tooth thickness on actual pitch circle.

Q8) a) What is design for assembly? Explain the general principles to be followed while designing the parts for assembly. **[6]**

b) A straight tensile bar of diameter 10 ± 0.1 mm are made of plain carbon steel $40C_8$ having tensile yield strength of 330 ± 30 N/mm^2. The load on the bars is 23.5 ± 5kN. If the diameters, strengths and load are normally distributed, estimate the reliability of withstanding the load by the bars.

The area under the standard normal distribution curve from 'zero' to 'Z' are as follows: **[10]**

Z	1.0	1.2	1.4	1.6	1.8	2.0
Area	0.3413	0.3849	0.4192	0.4452	0.4641	0.4772

2.2	2.4	2.6	2.8	3.0
0.4861	0.4918	0.4953	0.4974	0.4987

Q9) a) Discuss the various design consideration for connecting rod of I.C.Engine. **[6]**

b) Design a cast iron piston for a single acting four stroke engine for the following specifications.

Cylinder bore = 100 mm

Stroke length = 120 mm

Max. gas pressure = 5N/mm^2

Brake mean effective pressure = 0.65 N/mm^2.

Fuel consumption = 0.227 kg/kW/hr.

Speed = 2000 rpm.

Assume suitable data if necessary. **[10]**

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

a) Design for fatigue failure.

b) S and S_o spur gears.

c) Classical lamination theory of composite material.

Total No. of Questions :10]

SEAT No. :

P3258

[Total No. of Pages :2

[4660]-147

M.E. (Mechanical) (Design Engineering)

ANALYSIS AND SYNTHESIS OF MECHANISMS

(2008 Course) (Semester - II) (502210)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Explain the following terms related to synthesis problems: **[6]**

i) Function generation

ii) Path generation

iii) Motion generation

b) What is Kutzback's criterion for degree of freedom of plane mechanisms? In what way Grubler criterion is different from it? **[6]**

c) What are the standard assumptions made in the Kinematic analysis of Mechanisms? **[4]**

Q2) a) Explain the dynamics of mechanisms with elastic links. **[8]**

b) State any two forms of Euler - Savary equation and then derive any one of them from the other. **[8]**

Q3) a) Explain the "Matrix method" of analysis of mechanisms. **[8]**

b) Explain Fixed Centrode and moving Centrode. **[8]**

Q4) a) Explain the force analysis of a four bar slider crank linkage. **[8]**

b) Explain with sketch the significance of 'inflection circle'. What is its use in kinematics? **[8]**

P.T.O.

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

a) Inertia forces in linkages.

b) Ball's point and its significance.

c) Application in Dwell Mechanisms.

d) Elastic Linkage Model.

SECTION -II

Q6) a) Derive the Frudenstein's displacement equation for a four bar mechanism. **[8]**

b) A slider crank mechanism with offset = 1 cm, has the crank length = 5 cm and coupler length = 12 cm, Construct the inflection circle when the crank makes 45^{o} with the line of stroke of slider. Then locate the centre of curvature of the mid-point of the coupler link. **[8]**

Q7) a) Explain the Denavit - Hartenberg parameters for the Hook joint with a neat sketch. **[8]**

b) Explain the matrix method of analysis for special mechanisms. **[8]**

Q8) a) State and prove Robert-Chebychev theorem. **[8]**

b) What is the pole of coupler link of four bar mechanism? Enumerate its properties? What is relative pole? **[8]**

Q9) a) Write a note on branch and order defect? Explain cusp point and crunodes point. **[8]**

b) Define the term 'Dyad' and derive its standard form equation. **[8]**

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

a) Symmetric coupler curves.

b) Bermester points.

c) Point position reduction.

d) Graphical synthesis for function generation.

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Total No. of Questions : 10]

SEAT No. :

P3301

[Total No. of Pages : 4

[4660] - 148

M.E. (Mechanical) (Design Engineering)

RELIABILITY ENGINEERING

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What is reliability? Explain Hazard rate, Failure density function. **[8]**

b) Following table shows the test results of 800 machine components, tested simultaneously. Evaluate : Hazard rate, failure density function and reliability. **[8]**

Operating Time (Hrs.)	0	100	200	300	400	500	600	700	800	900	1000
No. of surviving components	800	770	690	640	630	610	580	540	400	384	360

Q2) a) Explain quality and reliability assurance rules. **[8]**

b) A commuter owns two cars, one is a compact model and the other a standard model. About three-fourth months of the time he uses the compact to travel to work and about one fourth of the time the bigger car is used. When he uses the compact car, he gets home by 5.30 pm about 75% of the time; if he uses the standard size car, he gets home by 5.30 pm about 60% of the time (but he enjoys the air conditioner in the larger car).

If gets home after 5.30 pm., what is the probability that he used the compact car? **[8]**

P.T.O.

Q3) a) Explain path set methodology with one example. **[8]**

b) The failure rates of three components are $0.065^* 10^{-3}$, $0.180^* 10^{-3}$ and $0.96^* 10^{-3}$ per hour. Evaluate the failure rate, MTTF of a system and the reliability at 500 hours if these components are connected in series and in parallel. **[8]**

Q4) a) A space vehicle requires three out of its four main engine to operate in order to achieve orbit. If engine have reliability of 0.97, determine the reliability of achieving orbit. **[8]**

b) Define and explain following terms with the help of suitable example: **[8]**

i) Bays rule.

ii) MTBF and MTTF.

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

a) Importance of Reliability.

b) Bath Tub Curve.

c) Markov Analysis.

d) Central limit theorem.

SECTION - II

Q6) a) In the life-testing of 100 specimens of a particular device, the number of failures during each time interval of 20 hours is shown in table (a). Estimate the MTTF for these specimens. **[8]**

Time Interval Hours	Number of failures during interval
$T \leq 1000$	0
$1000 < T \leq 1020$	25
$1020 < T \leq 1040$	40
$1040 < T \leq 1060$	20
$1060 < T \leq 1080$	10
$1080 < T \leq 1100$	5

Table (a)

b) Explain with neat sketch fault tree analysis and its construction. **[8]**

Q7) a) It is observed that the failure pattern of an electronic system follows on exponential distribution with mean time to failure of 1000 hours. What is the probability that the system failure occurs within 750 hours? **[8]**

b) Define availability and maintainability. Discuss how "operational availability" is different from "inherent availability". **[8]**

Q8) a) A system consists of 6 sub-systems connected in series as shown in Table (b). The reliability goal is 0.993 for period of 20 hours operation. Compute the reliability goal for each sub-system using AGREE method of allocation. **[8]**

Sub-system	Number of Modules	Operating Modules	Importance Factor
1	30	20	1.0
2	75	18	0.98
3	40	20	1.0
4	50	16	0.95
5	60	14	0.93
6	70	20	1.0

Table (b)

b) Explain briefly the various methods of assessing reliability of a component through accelerated tests. **[8]**

Q9) a) Explain the procedure for construction of FMECA Table for any mechanical system. **[8]**

b) Define 'Redundancy' in a system. Explain: **[8]**

i) Active.

ii) Passive and

iii) Partially active redundancy.

Q10) Write the short note on following (Any Three): **[18]**

a) Risk Priority Number in FMEA.

b) Cut set and tie set for reliability evaluation.

c) Safety Margin and Safety Factor.

d) Economic aspects of maintenance.

Total No. of Questions : 8]

SEAT No. :

P3259

[Total No. of Pages :2

[4660]-149

M.E. (Mechanical- Design Engineering)

ENGINEERING FRACTURE MECHANICS

(Elective-III) (2008 Course) (Semester-II) (502211-B)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any 2 Questions out of questions 1,2 and 3. Question 4 is compulsory. Solve any 2 Questions out of questions 5, 6 and 7. Question 8 compulsory.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary. Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION-I

Q1) Derive an expression for energy release rate, clearly mention the assumptions and draw neat sketch to show energy balance. **[16]**

Q2) Explain the Crack Opening Displacement Criteria used to quantify the fracture toughness of SENB specimen. **[16]**

Q3) Explain with neat sketch the element used in FEM to model crack tip stresses. **[16]**

Q4) Write a short note on: **[18]**

a) Strain Energy release rate.

b) Plastic constrain factor.

c) Irwin's fracture criterion.

P.T.O.

SECTION-II

Q5) Explain the test used to determine fracture toughness parameter *J-Integral*. **[16]**

Q6) Draw typical S-N curve for mild steel and aluminum; explain the differences. **[16]**

Q7) Explain the different stages of fatigue crack initiation and propagation. **[16]**

Q8) Write a short note on the following: **[18]**

a) Fatigue crack propagation laws.

b) Effect of stress concentration on fatigue.

c) Sub critical crack growth.

□□□□

Total No. of Questions : 8]

SEAT No. :

P2740

[Total No. of Pages : 2

[4660] - 15

M.E. (Civil) (Construction and Management)
a: ADVANCED CONSTRUCTION TECHNOLOGY
(2008 Pattern) (Elective - III) (Semester - II) (501111)

Time :4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Discuss the challenges faced in the project of construction of Thermal power station w.r.t. following point. **[18]**

a) Environmental issues

b) Resource management

c) Planning & scheduling

d) Risk management

Q2) Give the sequence of operations for construction of piers using slip form technique. Explain with the help of neat sketches. **[16]**

Q3) Explain the working of Tunnel Boring Machine used for the construction of a metro line in Mumbai. **[16]**

Q4) Discuss the challenges faced while constructing jetty. **[16]**

P.T.O.

SECTION - II

Q5) What are the duties of 'Maintenance Head' of an atomic power station? Also give the maintenance manual for the critical activities. **[18]**

Q6) Write a detailed note on construction of diaphragm wall. **[16]**

Q7) What are the precautions to be taken at the time of construction of machine foundations used in a cement manufacturing industry? Explain in detail, considering the complete manufacturing procedure. **[16]**

Q8) Write detailed notes on fast track construction used for housing colonies and road projects. **[16]**

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Total No. of Questions : 10]

SEAT No. :

P3302

[Total No. of Pages : 2

[4660] - 150

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

C : COMPUTER AIDED ENGINEERING

(2008 Pattern) (Elective - III)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What is Simulation? Write its design procedure in detail. **[8]**

b) Discuss the design procedure of modeling and its application. **[8]**

Q2) a) Explain in detail geometric modeling technology. **[8]**

b) Write note on data exchange issues. **[8]**

Q3) a) Write in detail modern features in modeling. **[8]**

b) Explain in detail use of geometry in design and analysis. **[10]**

Q4) a) What are steps in FEA? **[8]**

b) Write in detail design parameters in FEA software. **[8]**

Q5) a) Write short note on any two: **[10]**

i) Meshing.

ii) Mesh refinement.

iii) FEM software constraints.

b) Discuss in detail Mechanical design criteria. **[6]**

P.T.O.

SECTION - II

Q6) a) Distinguish between CAD and CAM. **[8]**

b) Explain in detail Von Misses stresses. **[8]**

Q7) a) Explain in detail design of component for stress analysis. **[8]**

b) Explain in detail need of CAD. **[8]**

Q8) a) Explain in detail verification of result for component analyzed. **[8]**

b) What is concept of CFD? Write one case study of CFD. **[10]**

Q9) a) Explain solution algorithm in detail. **[8]**

b) What are features of CFD modeling for steady in compressible flow? **[8]**

Q10) a) Write short notes on: **[8]**

i) Grid design.

ii) Safety regulations.

b) Explain in role of CFD software in engineering applications. **[8]**

Total No. of Questions : 10]

SEAT No. :

P2226

[Total No. of Pages : 2

[4660]-151

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

a - VEHICLE DYNAMICS

(Semester - II) (2008 Pattern) (Elective - IV) (502212)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain most commonly used frequency weightings for whole-body vibration. **[6]**

b) The sprung parts of a passenger car weigh 9.5kN and the unsprung parts weigh 850 N. The combined stiffness of the suspension springs is 41.5 kN/m and that of the tires is 551.3 kN/m. Determine the two natural frequencies of bounce motion of the sprung and unsprung mass. **[10]**

Q2) a) Explain in brief the combined pitch and bounce motion an application to multi wheel station vehicles. **[8]**

b) Explain Kinematic behavior of vehicles with rigid wheels and with compliant tires. **[8]**

Q3) a) Derive an expression for the steer angle δf required to negotiate a given turn with usual notations. **[8]**

b) A rear engine rear wheel drive passenger car has a mass of 1150 kg. The weight distribution on the front axle is 35% and that on rear axle is 65% under static condition. If cornering stiffness each of the front tires is 31kN/rad and that of rear tires is 34kN/rad determine the steady state handling behavior of the vehicle. If the vehicle has wheel base of 2.23 m find critical / characteristics speed of vehicle. **[8]**

P.T.O.

Q4) What are test carried out for determining handling characteristics of vehicle? Explain each test in detail. **[16]**

Q5) Write Short Notes on: **[18]**

a) ISO Standard for Human Response to Vibrations.

b) Characteristic and Critical speeds.

c) Natural frequency and damping in yaw.

SECTION - II

Q6) a) Explain two degree of freedom theory to include effects of traction and braking. **[8]**

b) Explain in Brief the analysis of sprocket torques and speeds, required to skid steer a tracked vehicle. **[8]**

Q7) A passenger car weighs 1.2kN and has a wheelbase of 2.3m. The center of gravity is 0.9m behind the front axle and 0.5 m above ground level. The braking effort distribution on the front axle is 65%. The coefficient of rolling resistance is 0.02. Determine which set of the tires will lock first on two road surfaces: one with a coefficient of road adhesion μ = 0.8, and the other with = 0.2 **[16]**

Q8) Explain with the help of labeled sketch mechanism and handling of tracked vehicle (military vehicle). **[16]**

Q9) A passenger car weighs 20 kN and has a wheelbase of 2.8m. The center of gravity is 1.3 m behind the front axle and 50cm above ground level. In practice, the vehicle encounters a variety of surfaces, with the coefficient of road adhesion ranging from 0.2 to 0.8 and the coefficient of rolling resistance of 0.015. With a view to avoiding the loss of directional stability on surfaces with a low coefficient of adhesion under emergency braking conditions, what would you recommend regarding the braking effort distribution between the front and rear axles? **[16]**

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

a) Frequency response of road vehicle in yaw.

b) Frequency response function.

c) Skid steering.

Total No. of Questions : 8]

SEAT No. :

P3260

[Total No. of Pages : 3

[4660] - 152
M.E. (Mechanical) (Design Engg.)
b- INDUSTRIAL TRIBOLOGY
(2008 Course) (Semester - II) (Elective - IV) (502212)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the term Wear. Explain in detail different types of wear experienced in mechanical systems? Discuss the effect of temperature and load on wear. **[8]**

b) Derive and Explain terms in Rowe's Modified adhesion Theory. **[8]**

Q2) a) A hydrodynamic plane slider bearing operates under the following conditions. **[10]**

Required load carrying capacity = 30.5 kN

Bearing width to length ratio = 3.75

Attitude = 2.0

Minimum oil film thickness = 0.02mm

Viscosity of oil = 20 cP

Sliding speed = 2 m/s

Neglecting the side leakage, Calculate

P.T.O.

i) The bearing dimensions

ii) The pressure at a distance of 50mm from leading edge

iii) The tractive effort on bearing

iv) The coefficient of friction and

v) The power lost in friction.

b) Explain the principal of working of Hydrodynamic bearing. **[6]**

Q3) a) Derive an expression for load carrying capacity and oil flow rate for hydrodynamic step bearing. State the assumptions made. **[10]**

b) Write assumptions made while deriving Reynolds equation and limitations of Reynolds equation. **[6]**

Q4) Write a note on following [Any Three] **[18]**

a) Lubrication Regimes

b) Adhesion Theory of Friction. [simple]

c) Heat in bearings

d) Infinitely short and infinitely long journal bearings.

SECTION - II

Q5) a) A circular plate of 60mm radius is approaching the base plane at a velocity of 150 mm/s at a instant when the oil-film thickness is 0.2mm. If the absolute viscosity of the oil is 0.025 Pa-s, calculate **[10]**

i) the load carrying capacity of the oil-film at the given instant:

ii) The maximum pressure and

iii) The average pressure.

b) Explain any six situations where Hydrostatic squeeze film exists. **[6]**

Q6) Using modified Reynolds equation for Elasto-hydrodynamic lubrication, derive Ertel Grubin equation. State limitations of this equation. **[16]**

Q7) Assuming generalized Reynolds equation, derive Reynolds equation for aerodynamic bearings in dimensionless form. Explain various terms in the equation. State the advantages and limitations of air lubricated bearings. Give their applications. **[16]**

Q8) Write a note on following [Any Three] **[18]**

a) Mechanism of tyre-road interaction.

b) Tribological aspect of wheel on rail contact.

c) Power losses in Hydrostatic step bearing

d) Piston pin lubrication.

☼ ☼ ☼

Total No. of Questions : 8]

SEAT No. :

P3303

[Total No. of Pages : 2

[4660] - 154

M.E. (Mechanical) (Mechatronics)

APPLIED NUMERICAL METHODS AND COMPUTATIONAL TECHNIQUES

(2008 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Write a short note of solution of Wave Equation using numerical method. **[8]**

b) Compute L and U matrices for the following matrix. **[8]**

$$\begin{bmatrix} 2.00 & -1.00 & 0.00 \\ -1.00 & 2.00 & -1.00 \\ 0.00 & -1.00 & 2.00 \end{bmatrix}$$

Q2) a) Fit a straight line to the points (1, 0.5), (2, 2.5), (3, 2), (4, 4), (5, 3.5), (6, 6) and (7, 5.5) using linear regression. **[8]**

b) Apply Lagrange's interpolation formula to find a polynomial which passes through the points (0, -20), (1, -12), (3, -20) and (4, -24). **[8]**

Q3) The Gauss Points and Gauss Weights for three point formula are as given in table below. **[16]**

Gauss Points	0.77459	0.00000	0.77459
Gauss Weights	0.55555	0.88888	0.55555

Evaluate the integral

$$\int_0^4 (3x^2 + 2x + 1)dx.$$

Compare it with analytical solution and comment or error.

P.T.O.

Q4) a) Discuss Shooting Method with algorithm. **[8]**

b) Evaluate $\int_0^1 \frac{1}{1+x}\,dx$ correct to three decimal places using Romberg's method. **[10]**

Hence find value of $\log_e 2$.

(Hint : Take h = 0.5, 0.25 and 0.125 and use trapezoidal rule).

SECTION - II

Q5) a) Discuss four steps of Finite Element Method. **[8]**

b) Discuss the algorithm for double interpolation. **[8]**

Q6) Solve the equation **[16]**

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$

and the boundary conditions are

$u(0,t) = \sin(\pi x) 0 \le x \le 1;$

$u(0,t) = u(1,t) = 0$

using Crank Nicolson Method. Taking h = (1/3) and K = (1/36).

Q7) a) Discuss the algorithm for LU Decomposition Method. **[9]**

b) Compare Simpson's One Third rule and Simpsons 3/8 rule used for numerical integration. **[9]**

Q8) Evaluate $I = \int_1^2 \int_1^2 \frac{1}{x+y}\,dxdy$ using Trapezoidal rule with h = k = 0.25. **[16]**

Total No. of Questions : 8]

SEAT No. :

P2227

[Total No. of Pages : 4

[4660]-157

M.E. (Mechanical - Mechatronics)

a - DESIGN OF MACHINE ELEMENTS

(2008 Course) (Elective - I) (Semester - I) (502804)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What is weighted point method? Write the different steps involved in this method. **[8]**

b) Explain the following heat treatment process; **[8]**

i) Normalizing.

ii) Hardening.

Q2) a) What is mean by endurance strength of the material? How does the size and surface condition of component and type of load affect such strength? **[6]**

b) A link of 400mm length and a rectangular cross section (h = 2t) is subjected to a force of 30 KN. If the maximum elongation is 0.13 mm, determine the thickness 't' and height 'h' of the section. Allowable strength of the material is 300N/mm^2. **[6]**

c) Define endurance limit. Differentiate between failure due to static load and fatigue load.

Q3) a) Define equivalent torsional moment and equivalent bending moment. State when these two terms are used in the design of shafts. **[6]**

P.T.O.

b) A transmission shaft supporting a spur gears B and pulley D is shown in fig. 1. The shaft is mounted on two bearings A and C. The diameter of pulley and pitch circle diameter of gear are 450mm and 300 mm respectively. The pulley transmits 20 KW power at 500 rpm to the gear. P_1 and P_2 are belt tensions in the tight and loose sides, while P_t and P_r are tangential and radial components of gear tooth force. Assume $P_1 = 3P_2$ and $P_r = P_t \tan 20°$. The gear and pulley are keyed to the shaft. The material of the shaft is steel 50C4 (Sut = 700 and Syt = 460 N/mm^2). The factor K_b and K_t of ASME code are 1.5 each. Determine the shaft diameter using ASME code. **[10]**

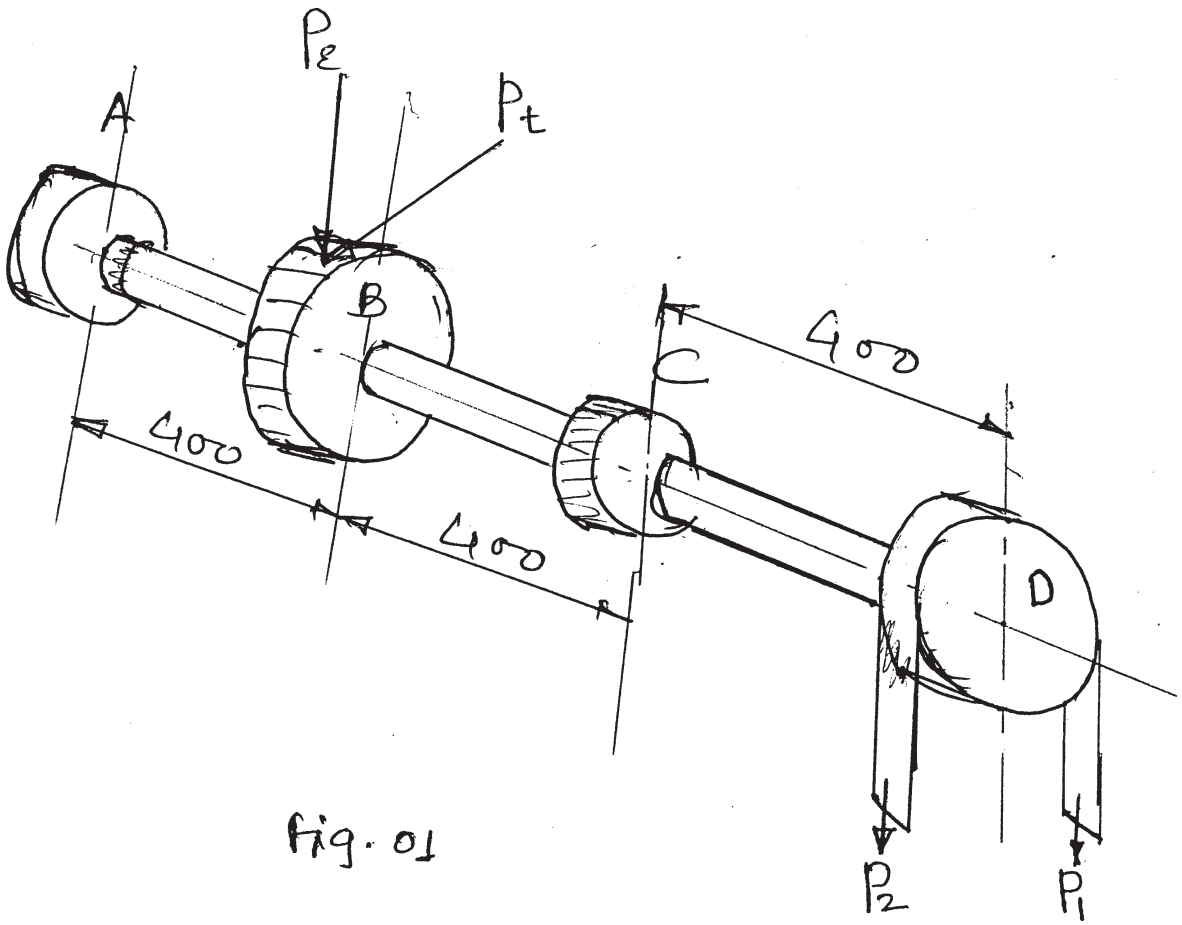


fig. 01

Q4) Write short note on the following: **[18]**

a) ASME code of shaft design.

b) Maximum shear stress theory of failure.

c) Design procedure of Bushed - pin flexible coupling.

SECTION - II

Q5) a) Explain the following terms used for helical spring: **[4]**

i) Spring index.

ii) Active Coils.

iii) Wahls factor.

iv) Spring Stiffness.

b) Draw the constructional details of a leaf spring with neat sketch and explain briefly function of each components. State its material. **[4]**

c) It is required to design a helical compression spring subjected to a maximum force of 7.5KN. The mean coil diameter should be 150mm from space consideration. The spring rate is 75N/mm. The spring is made of oil hardened and tempered steel wire with ultimate tensile strength of 1250 N/mm^2. The permissible shear stress for the spring wire is 30% of the ultimate tensile strength ($G = 81370\ N/mm^2$). Calculate; **[8]**

i) Wire diameter and

ii) Number of active coils.

Q6) a) How do you express the life of a bearing? What is an average or median life? Explain the factors influencing the life of a bearings? **[8]**

b) A single row deep groove ball bearing is subjected to a 30 seconds work cycle that consists of the following two parts: **[8]**

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

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

Q7) a) Discuss the desing procedure of spur gears. **[8]**

b) A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20º, while the helix angle is 25º. The face width is 40mm and the normal module is 4 mm. The pinion as well as gear is made of steel 40C8 (S_{ut} = 600 N/mm^2) and heat treated to a surface hardness of 300 BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for dynamic load and calculate the power transmitting capacity of gears. **[8]**

Q8) Write short note on the following: **[18]**

a) Optimum design of helical spring.

b) Preloading in rolling contact bearing.

c) Pitting failure its causes and remedies.

Total No. of Questions : 10]

SEAT No. :

P2228

[Total No. of Pages : 3

[4660]-158

M.E. (Mechanical) (Mechatronics)

b - DIGITAL SIGNAL PROCESSING

(Elective - I) (2008 Course) (Semester - I) (502804)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Prove that the necessary and sufficient condition for an LTI system to be stable is $\sum_{-\infty}^{\infty} |h(n)| < \infty$. **[8]**

b) Consider an analog signal $X_a(t) = 4\cos 200wt$. **[8]**

i) Determine minimum sampling rate to avoid aliasing.

ii) Suppose signal sample at $f_s = 400$Hz what is discrete time signal obtained after sampling.

iii) Suppose signal sample at $f_s = 150$ Hz what is discrete time signal obtained after sampling.

Q2) a) Find the convolution of the signal $x(n) = 1$ $n = -2, 0, 1$

$= 2$ $n = -1$

$= 0$ elsewhere

$h(n) = \delta(n) - \delta(n-1) + \delta(n-2) + \delta(n-3)$ **[8]**

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

i) $y(n) = e^{x(n)}$

iii) $y(n) = \sin^2 wn\, x(n)$

P.T.O.

Q3) a) State and prove: **[8]**

i) Linearity property of Z transform.

ii) Time reversal property of Z transform.

b) Find Z transform of the following discrete time signal and ROC for each **[8]**

i) $x(n) = (1/2)\delta(n) + \delta(n-1) - (1/3)\delta(n-2)$

ii) $x(n) = u(n)$

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

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

a) Circular convolution.

b) Relation between ZT and FT.

c) Energy and power signal.

d) DTMF.

e) Barrel shifter.

SECTION - II

Q6) a) Perform circular convolution of the following two sequences. **[8]**

$X_1(n) = \{1, 1, 1, 1\}$

$X_2(n) = \{2, 3, 4, 5\}$

b) Compute the DFT of the signal $x(n) = \{4, 3, -1, 5\}$ considering $N = 4$. **[8]**

Q7) a) Distinguish between microprocessor and Digital signal processor. **[8]**

b) With neat block diagram explain the architectural detail of DSP chip. **[8]**

Q8) a) Establish the system transfer function of the system defined by **[8]**

$y(n)-(1/4)y(n-1)= x(n)-(3/4)x(n-1)$

Also realize the same using DF - I and DF - II methods.

b) Give the equation for and characteristics of the following windows. **[8]**

i) Hanning.

ii) Triangular window.

Q9) a) With the help of frequency response explain HPF and BPF in detail. **[8]**

b) Explain any one application of DSP in mechatronics in brief. **[8]**

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

a) Selection criteria for any DSP processor as per application.

b) Power spectral density.

c) Linear filtering based on DFT.

d) Harvard architecture.

e) Filter structures.

Total No. of Questions : 8]

SEAT No. :

P2741

[Total No. of Pages :2

[4660]-16

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

b-INFRASTRUCTURE DEVELOPMENT

(2008 Course) (Semester-II) (Elective-III) (501111)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) Discuss in detail the relevance and importance of projects like interlinking of rivers. Enlist and explain the factors that influence the success of such projects. **[18]**

Q2) Explain the concept of life cycle costing of infrastructure projects with a suitable example. **[16]**

Q3) Energy is a key component of a nations progress. With respect to the Indian context, explain various sources of energy. Discuss in detail the provisions and measures proposed in the 12^{th} Five year plan for energy selfsufficiency. **[16]**

Q4) Enlist various components of urban infrastructure. What is the scope of JNNURM? Explain the provision made under JNNURM for the above mentioned components in urban infrastructure. **[16]**

P.T.O

SECTION-II

Q5) With suitable example, explain the role of private sector in Infrastructure development. What are the different models of private sector participation in public projects? Explain the relative merits and demerits of any one type of model. **[18]**

Q6) a) Explain in detail the concept of dedicated freight corridor. Enlist various provisions made for the modernization of Indian Railways. **[8]**

b) Explain in detail the scope for development and modernization of civil aviation sector with suitable example. **[8]**

Q7) a) Explain the concepts of Ultra Mega Power Plants and Super Critical Power Plants. With respect to the 12^{th} five year plan what are the various provisions made by Government of India. **[8]**

b) Enlist the objectives of PMGSY. What are the measures adopted by the government for successful implementation of this project. **[8]**

Q8) Write short notes on (any three): **[16]**

a) Port connectivity.

b) Rural water supply and sanitation projects.

c) Incentives for renewable energy sources.

d) Inland water transport: Prospects and benefits.

□□□□

Total No. of Questions : 8]

SEAT No. :

P3304

[Total No. of Pages : 3

[4660] - 160

M.E. (Mechatronics)

CONTROL SYSTEMS

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

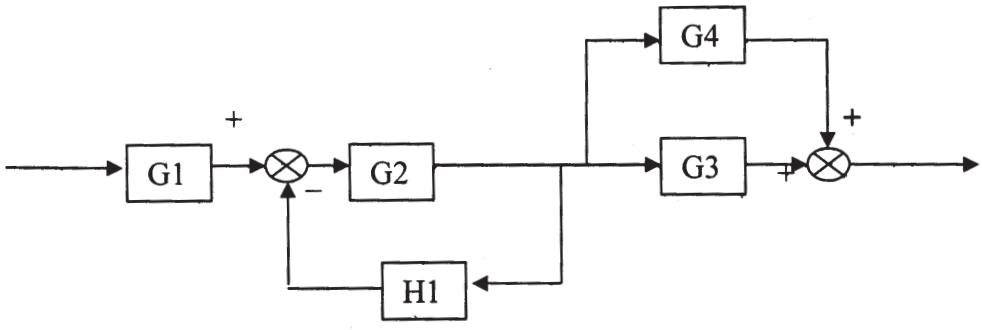
SECTION - I

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

i) Linear and nonlinear control systems.

ii) Open loop and Closed loop system.

b) Reduce the following block diagram of the system shown in following figure into a single equivalent block by block diagram reduction technique. **[10]**



Q2) a) Obtain the closed loop transfer function for the above block diagram using Mason's gain formula. **[10]**

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

P.T.O.

Q3) a) Examine the stability by Routh's criterion for the characteristics equation. **[10]**

$S^5 + S^4 + 3S^3 + 2S^2 + 3S + 4 = 0.$

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

Q4) a) The closed loop transfer function of a unity feedback control system is **[10]**

$$G(S)H(S) = \frac{K}{S(S+2)(S+5)}$$

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

b) Explain the following terms. **[6]**

i) State.

ii) State variable.

iii) State vector.

SECTION - II

Q5) a) Discuss meaning of under damped and over damped system with respect to transient response of a system. If system has open loop transfer function as $G(S)H(S) = \frac{25}{S^2 + 6S + 25}$ **[12]**

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

b) Discuss the characteristics of on off controller and proportional controller. **[6]**

Q6) a) Write short notes on. **[8]**

i) Controllability.

ii) Observability.

b) Explain the characteristics of integral controller and derivative controller. **[8]**

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

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

Sketch Bode plot. Determine from it

i) Gain crossover frequency.

ii) Phase crossover frequency.

iii) Gain margin.

iv) Phase margin.

v) Stability of system.

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

Q8) a) What is neural control system? Explain its features with applications. **[8]**

b) Explain the fuzzy system with the help of fuzzy logic based control system. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3261

[Total No. of Pages : 4

[4660] - 161

M.E. (Mechanical - Mechatronics)

b - THEORY OF MACHINES AND MECHANISMS

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

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain different types of constrained motions with suitable examples. **[5]**

b) Define Inversion of a Mechanism? Explain with the help of neat sketches inversions of a double slider crankchain? Give their applications? **[5]**

c) Write short notes on the following: **[6]**

i) Heart's straight line mechanism.

ii) Grass Hooper's straight line mechanism.

Q2) a) What is instantaneous centre of rotation? Explain various types of instantaneous centre of rotation with suitable example. **[4]**

b) Fig. 01shows the structure of Whitworth quick return mechanism used in reciprocating machine tools. The various dimensions of the tool are as follows: OQ = 100 mm; OP = 200 mm, RQ = 150 mm and RS = 500 mm. The crank OP makes an angle of 60^{o} with the vertical. Determine the velocity of the slider S (cutting tool) when the crank rotates at 120 r.p.m.

P.T.O.

clockwise. Find also the angular velocity of the link RS and the velocity of the sliding block T on the slotted lever QT. **[12]**

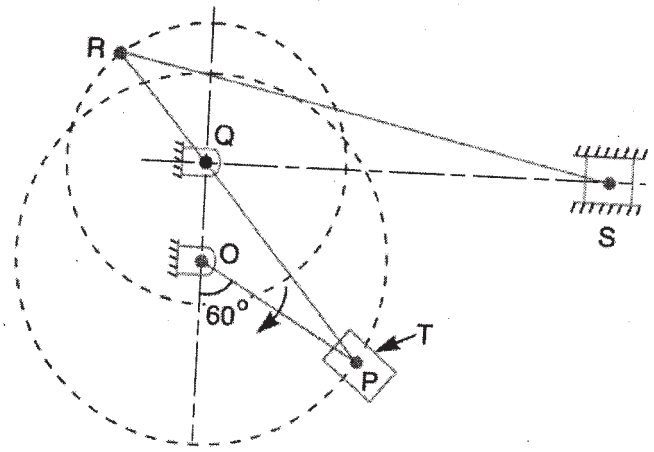


Fig. 01

Q3) a) An I.C. Engine runs at 2100 rpm. The length of the connecting rod is 250 mm and crank radius is 50 mm. Determine at 35% of outstroke, **[6]**

i) Angular position of the crank.

ii) Linear velocity and acceleration of piston.

iii) Angular velocity and angular acceleration of the connecting rod.

iv) Crank angle for maximum velocity.

v) Maximum piston velocity.

vi) Crank angle for zero acceleration of piston.

b) The dimensions of the Andreau differential stroke engine mechanism, as shown in Fig. 02, are as follows: AB = 80 mm; CD = 40 mm; BE = DE = 150 mm; and EP = 200 mm. The links AB and CD are geared together. The speed of the smaller wheel is 1140 r.p.m. Determine the velocity and acceleration of the piston P for the given configuration. **[12]**

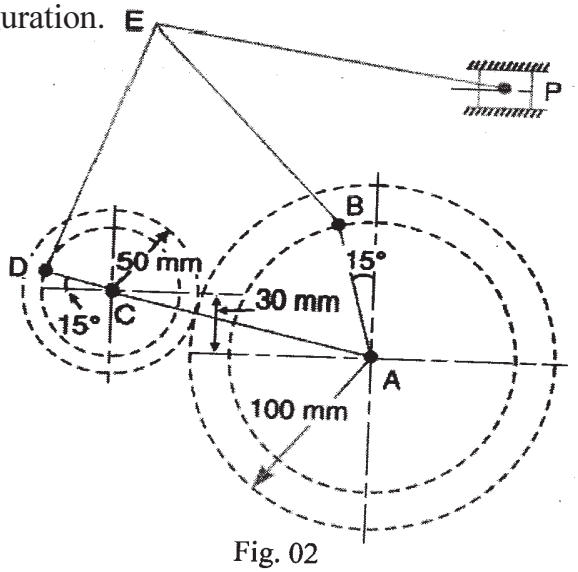


Fig. 02

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

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

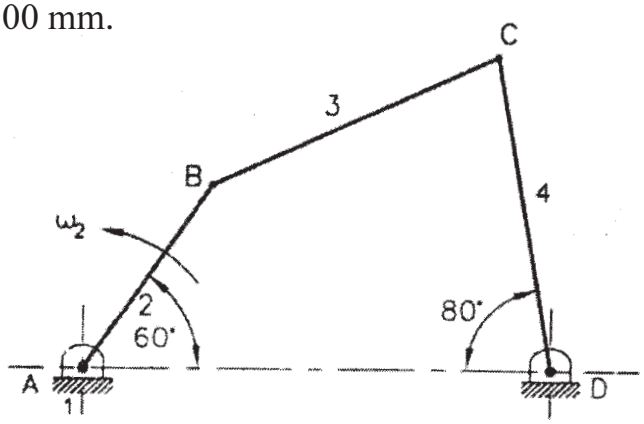


Fig. 03

SECTION - II

Q5) a) Explain three position syntheses for four bar mechanism by using relative pole method. **[6]**

b) Design a four bar mechanism with input link a, coupler link b, and output link c. Angles θ and Φ for three successive positions are given below: **[10]**

Position	1	2	3
θ	20^o	35^o	55^o
Φ	35^o	45^o	60^o

If the grounded link d = 1 unit, using Freudenstein's equation, find out lengths of other links to satisfy the given positional conditions.

Q6) a) Define in short, Free vibrations, Forced vibrations & Damped vibrations. **[6]**

b) A shaft of 50 mm diameter and 3 m long is simply supported at the ends and carries three loads of 1000 N, 1500 N and 750 N at 1m, 2 m and 2.5m from the left support. The young's modulus for shaft material is 200 GN/m^2. Fin the frequency of transverse vibration. **[10]**

Q7) a) Write short note on cam jump phenomenon. **[4]**

b) Draw the profile of a cam operating a roller reciprocating follower with following data:

Minimum radius of cam = 25,

Lift = 30 mm, Diameter of roller = 15 mm.

The cam lifts the follower for 120^{o} with SHM followed by a period of dwell for 30^{o}. Then the follower lowers down during 150^{o} of the cam rotation with uniform acceleration and deceleration, acceleration being ½ retardation, followed by a dwell period. **[12]**

If the cam rotates at a uniform speed of 150 rpm, calculate the maximum velocity and acceleration of the follower during ascent and descent period.

Q8) a) Write short note on Bobillier construction. **[6]**

b) Discuss the effect of inertia on the shaft in longitudinal and transverse vibration. **[6]**

c) Derive equations for displacement velocity and acceleration for a tangent cam operating a radial translating roller follower when the contact is on the nose. **[6]**

Total No. of Questions : 8]

SEAT No. :

P3305

[Total No. of Pages : 2

[4660] - 163
M.E. (Mechanical) (Mechatronics)
MICROCONTROLLERS
(2008 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) With the help of block diagram explain the architecture of 8051. **[10]**

b) Compare microprocessor and microcontroller. **[8]**

Q2) a) Explain the different addressing modes of 8051. **[8]**

b) Explain the following instructions of 8051. **[8]**

i) DAA

ii) ADD A, 0F 3H

iii) RRC

iv) SWAP A

Q3) a) Explain in detail the different modes of serial communication. **[8]**

b) Write a program for keyboard interfacing and explain it. **[8]**

Q4) Write short notes on : **[18]**

a) Logic Analyzer.

b) Selection criterion of microcontroller.

c) Different modes of Timers.

P.T.O.

SECTION - II

Q5) a) State the various features of PIC Microcontroller. **[8]**

b) Explain the memory organization of ARM. **[8]**

Q6) a) Explain in detail interfacing of 8 bit DAC to 8051. **[8]**

b) Explain in detail interfacing of ADC 0808 to 8051. **[8]**

Q7) a) Compare RS 232 and RS 485. **[8]**

b) Explain I2C bus in detail. **[8]**

Q8) a) Enlist the applications of ARM processor and explain any one. **[10]**

b) Compare RISC and CISC processor. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3306

[Total No. of Pages : 2

[4660] - 164

M.E. (Mechanical) (Mechatronics) (Semester - II)

INDUSTRIAL AUTOMATION

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain START and STOP button ladder programs used in PLC programming with usual notations. **[8]**

b) Compare delay on and delay off timers with suitable industrial application. **[8]**

Q2) a) Explain Count Up Timer Instruction w.r.t, conveyor with all status bits. **[8]**

b) Explain with a schematic diagram basic electromechanical relay with all its terminals. **[8]**

Q3) a) Significance of Boolean algebra in constructing ladder program. Explain with suitable example. **[8]**

b) Explain in brief the concept and applications of SCADA. **[8]**

Q4) a) Given four push buttons (S1, and S2) of Normally Open (NO) type, two lamps namely RED (L1) and GREEN (L2). Write the PLC ladder diagram for following objectives **[12]**

P.T.O.

i) When S1 is Pushed and S2 is not pushed RED lamp is On

ii) When S1 is not Pushed and S2 is pushed GREEN lamp is On

iii) When both the buttons are pushed or not pushed, both the lamps are Off

Write the names of input terminals to which switches are connected as well as output terminal names to which lamps are connected Write the Boolean (Digital) equations with truth table of each rung you draw Draw the ladder diagram using only Examine ON, Examine OFF and output coil symbols

b) List three important specifications of PLC. **[6]**

SECTION - II

Q5) a) Explain the full form of G codes for linear interpolation and circular interpolation. **[8]**

b) Explain Modal and Non Modal commands in NC part program with two examples each. **[8]**

Q6) a) Explain subroutines and subprograms in APT programming. **[9]**

b) Principle of working, and types of Position sensors used in CNC machines. **[9]**

Q7) a) Explain four M Codes with examples. **[8]**

b) Explain significance G94, G95, G98 and G99 with suitable example. **[8]**

Q8) a) Explain the full form of G codes for linear interpolation and circular interpolation. **[8]**

b) Explain Modal and Non Modal commands in NC part program with two examples each. **[8]**

Total No. of Questions : 10]

SEAT No. :

P3307

[Total No. of Pages : 2

[4660] - 165

M.E. (Mechanical) (Mechatronics) (Semester - II)

DRIVES & ACTUATORS

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Explain different methods to turn on Silicon Controlled Rectifier. **[8]**

b) Explain output and transfer characteristics of n channel E MOFSET. **[8]**

Q2) a) Explain generalized treatment of speed torque and multi quadrant operation of electric drive. **[8]**

b) Sketch and explain constant power and constant drive characteristics of DC series motor. **[8]**

Q3) a) Explain three phase full wave converter with R-L-E load. **[8]**

b) Explain static Schebrius drive used to control speed of three phase induction motor. **[8]**

Q4) a) Explain the unipolar and bipolar drive for stepper motor. **[8]**

b) Explain brushless DC motors and discuss different types of drive circuits for brushless DC motor. **[8]**

P.T.O.

Q5) Write short notes on (Any three). **[18]**

a) AC and DC Drives.

b) IGBT.

c) Four Quadrant Chopper.

d) Single phase fully controlled rectifier.

SECTION - II

Q6) a) List the types of Smart Actuators and explain the construction and working of any one of them in detail. **[8]**

b) Discuss, in detail, the selection criterion for Hydraulic Valves. **[8]**

Q7) a) Draw a neat labeled sketch discuss the construction and operation of a hall resolver. **[8]**

b) Discuss the procedure for tuning of the gains of the PID control using the "ZN Ultimate Gain Technique". **[8]**

Q8) a) Classify, in detail, actuators and discuss their selection criterion. **[8]**

b) Draw a neat labeled sketch and explain the use of the pulse coder in a closed loop system. **[8]**

Q9) Write a short note on (Any Two) **[16]**

a) Ball Valve.

b) Electromechanical Actuator.

c) Feed-forward Control System.

Q10) a) Draw the circuit diagram and explain the working of a Uni Polar Stepper Motor. **[9]**

b) Using a suitable block diagram discuss, in detail, the implementation of a PID control algorithm (parallel form) to improve the transient response of a second order system. **[9]**

Total No. of Questions : 8]

SEAT No. :

P3308

[Total No. of Pages :2

[4660] - 168
M.E. (Mechanical) (Mechatronics) (Semester - II)
Automotive Electronics
(Elective - III) (2008 Pattern)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***

2) ***Answers to the two sections should be written in separate answer books.***

3) ***Neat diagrams must be drawn wherever necessary.***

4) ***Figures to the right side indicate full marks.***

SECTION - I

Q1) a) Explain Engine RPM sensors with principle of working, resolution and repeatability. **[8]**

b) Explain construction of battery and two protections provided for it in automobiles. **[8]**

Q2) a) Explain two important safety provisions and sensors incorporated in power windows. **[8]**

b) Write short note on Modern trends in Spark Ignition Systems. **[8]**

Q3) a) Write short note on Distributor less ignition. **[9]**

b) Explain significance of wheel alignments. Explain in brief the sensors used in the process with their significance. **[9]**

Q4) a) Discuss in brief the electronic spark ignition control. **[8]**

b) Write a short note on Engine Control Unit. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain the role of throttle position sensor in Engine Control Unit. **[8]**

b) Compare Hydraulic power steering with Electronic power steering. **[8]**

Q6) a) Explain in brief the construction of sealed beams in modern automobiles. **[8]**

b) Explain two important features of central locking system used in luxury cars. **[8]**

Q7) a) Discuss in brief the sensors related to crank shaft. **[9]**

b) Explain the sensors used in Exhaust systems. **[9]**

Q8) a) Discuss in brief the preventive maintenance of Batteries. **[8]**

b) Explain the advantages of On Board Diagnostics. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P3466

[Total No. of Pages : 2

[4660] - 169

M.E. Mechanical (Mechatronics)

EMBEDDED SYSTEMS

(2008 Pattern) (Elective - IV)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Define Embedded systems. Explain its characteristics. **[8]**

b) What are the embedded system design challenges? Explain any four. **[10]**

Q2) a) What are the different selection criteria of microprocessor in embedded system? **[10]**

b) Explain the role of interrupts in embedded systems. What is the role of stack in interrupt execution mechanism? **[6]**

Q3) a) Which are the different methods of interfacing I/O devices? Explain briefly. **[8]**

b) Explain the interfacing of microcontroller with devices using I2C bus with timing diagram. **[8]**

P.T.O.

Q4) a) What is IEEE 802.11 protocol? Explain the data transfer using this protocol. **[8]**

b) Draw a schematic arrangement for a typical CAN network containing a master and number of slaves. Explain the process of data transfer amongst them. **[8]**

SECTION - II

Q5) a) What are the different software architectures? Explain round robin architecture in detail. What are its disadvantages. **[10]**

b) What is the difference between Real time operting systems and conventional OS? **[8]**

Q6) a) Explain how shared data problem can be solved using semaphores? **[8]**

b) What are the different task states? How task states are changed? **[8]**

Q7) a) What are the functions and applications of operating systems? Explain any one. **[8]**

b) With suitable example explain inter process communication using mailbox/ queue. **[8]**

Q8) a) With the help of block diagram explain the design of two dimensional robot arm. **[8]**

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

i) RFID

ii) Smart card

Total No. of Questions : 8]

SEAT No. :

P2742

[Total No. of Pages :2

[4660]-17
M.E. (Civil) (Construction and Management)
c-INTERNATIONAL CONTRACTING
(Semester-II) (2008 Pattern) (Elective-III) (501111)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) Detail out the minimum expectations from the World Bank Document checked while sanctioning the loans for the execution of an International construction contract. **[18]**

Q2) Discuss any 8 major variables which are critical to the performance of a construction project involving various multinational stakeholders performing under an international contract, with proper examples. **[16]**

Q3) Evaluate the various project risks and project returns that you would consider as a contracting firm, before submitting your final bid for a "nuclear power plant" construction project to be executed on an EPC basis. **[16]**

Q4) Discuss the " New Red Book" provisions for the general conditions of contract; FIDIC document. **[16]**

P.T.O.

SECTION-II

Q5) Discuss the various problems that occurred in the execution of the Basrah Housing International Project in Iraq and highlight the different solutions which emerged for solving these problems; in detail. **[18]**

Q6) Generally on any major project, the project management consultants (PMC) are multinational agencies who are selected, based on an exhaustive prequalification document scrutiny as per the World Bank guidelines, for selection of consultants. Explain this methodology in detail. **[16]**

Q7) Discuss the various funding options available to international bidders for project execution. Evaluate the effect of currency ratios permitted in the bid, and the effect of currency fluctuations on the project cost as well as the profit margin. **[16]**

Q8) Elaborate the following: **[16]**

a) CIDC-ICRA Rating.

b) UNICITRAL Provisions.

c) Advantages of Institutionalized Arbitration.

d) ESCROW account.

□□□□

Total No. of Questions : 8]

SEAT No. :

P2229

[Total No. of Pages : 3

[4660]-175

M.E. (Automotive)

a : ADVANCED HEAT TRANSFER

(Elective - I) (2010 Course) (Semester - I) (502302)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain different boundary conditions encountered in heat conduction problems. **[8]**

b) Consider a composite wall that includes an 8mm thick hardwood siding. 40mm by 130mm hardwood studs on 0.65m centres with glass fiber insulation (paper faced, 28kg/m^3), and a 12mm layer of gypsum wall board. What is the thermal resistance associated with a wall that is 2.5m high by 6.5m wide (having 10 studs, each 2.5m high)? **[8]**

Q2) a) Discuss the importance of unsteady state heat transfer problems. Explain the classical problem of transient heat conduction in an cylinder. **[8]**

b) Steel ball 12mm in diameter are annealed by heating to 1150K & then slowely cooling to 400K. in an air environment for which T_∞ = 325K and h = 20 W/m^2K. Assuming the properties of steel to be K = 40W/mk, δ=7800 kg/m^3, C = 600 J/kg K, estimate time required for cooling process. **[8]**

Q3) a) Distinguish between differential and integral analysis of boundary layer flow. **[4]**

b) What is Reynolds analogy? Explain. **[4]**

P.T.O.

c) In a thermal boundary layer, the temperature profile at a particular location is given by an expression.

$T(Y) = (A - BY + CY^2)$

Where, A, B & C are constants. Derive an expression for the corresponding heat transfer coefficient. **[8]**

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

a) Heisler & Grober charts.

b) Narier stokes equation.

c) Effect of Prandit no. on thermal boundary layer.

d) Numerical method for fin analysis.

SECTION - II

Q5) a) Derive the differential equation of heat convection in cartesian co-ordinates. **[6]**

b) Discuss the problems of laminar flow heat transfer in circular pipes with constant wall temperature and constant wall heat flux condition. **[4]**

c) Gas at 64ºC enters a 2 cm dia tube with a velocity of 2 m/s. Tube wall is maintained at 90ºC. Calculate the value of 'h'. Use following properties of gas;

δ = 0.9950 kg/m^3, Cp = 1.009 KJ/kgK,

μ = 208.2 × 10^{-7} Ns/m^2, ν = 2092 × 10^{-6} m^2/s

K = 30 × 10^{-3} W/mk. **[6]**

Q6) a) Define radiation intensity and develop relation between radiation intensity & emissive power. **[4]**

b) Explain: **[6]**

i) Multimode heat transfer

ii) Gaseous emission & absorption.

c) Two parallel plates 3m × 2m placed 1m apart, are maintained at 500ºC & 200ºC; their respective emissivities being 0.3 & 0.5. If temperature of the room in which these plates are located is 40ºC, estimate the heat lost by the hotter plate consider radiation only. **[6]**

Q7) Write notes on (any four): **[16]**

a) Conduction cooling.

b) Immersion cooling.

c) Cooling load estimation of electronic equipments.

d) Forced convection boiling.

e) Film Reynolds number and its importance.

Q8) a) Show that $E=\frac{NTU}{1+NTU}$ for counter flow and $t=\frac{1}{2}(1-e^{-2NTU})$ for parallel flow if the capacity rates of hot and cold fluids are same. **[9]**

b) A one shell two tube pass steam condenser consists of 3000 brass tubes of 20mm diameter. Cooling water enters the tubes at 20ºC. With a mean flow rate of 3000 kg/s. The heat transfer coefficient for condensation on the outer surfaces of the tube is 15500 W/m^2K. If the heat load of the condenser is $2.3 \times 10^8 W$. When steam condenses at 50ºC determine;**[9]**

i) The outer temperature of the cooling water.

ii) The tube length per pass using NTU method.

Total No. of Questions : 10]

SEAT No. :

P3442

[Total No. of Pages : 3

[4660]-176

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

FINITE ELEMENT METHOD

(2008 Pattern) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section I and 3 questions from Section II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Scientific Non-programmable calculator is allowed.***

SECTION - I

Q1) a) Explain step by step procedure of finite Element Method. **[8]**

b) Derive stiffness matrix of bar element. **[8]**

Q2) a) Determine displacement at nodes shown in figure below. **[12]**

$A_1=A_2=A_3=A_4=100\ mm^2$

$F_1=F_2=50N$

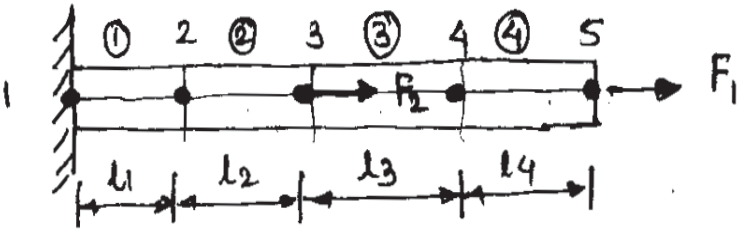
$l_1 = 100mm$

$l_2 = 125mm$

$l_3 = 150mm$

$l_4 = 125mm$

$E = 2.1 \times 10^5\ N/mm^2$



b) Write a note on Assembly procedure used in finite element Analysis **[4]**

P.T.O.

Q3) a) Explain following elements with sketch. **[8]**

i) Quadratic Element

ii) Cubic Element

b) Derive a stiffness matrix for Quadratic bar element using natural co-ordinate system. **[8]**

Q4) a) Explain plane stress condition with appropriate example. **[4]**

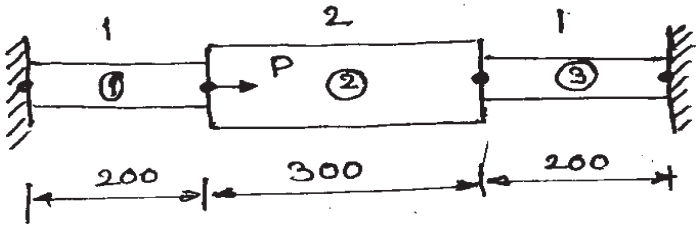
b) An axial load P = 200 × 10^3N is applied on a bar as shown. Using elimination approach determine nodal displacements, and stresses. **[12]**

$A_1 = 2400\ mm^2$

$E_1 = 70 \times 10^9 N/m^2$

$A_2 = 600\ mm^2$

$E_2 = 200 \times 10^9 N/m^2$



Q5) Solve any three: **[18]**

a) Solution methods using FEA

b) How to convert 3D Real life problem into 2D problems

(Hints : plane stress/strain)

c) Commercial FEA softwares

d) Compability conditions in FEM.

SECTION - II

Q6) a) Determine displacements and stresses at Nodes for Truss shown in figure. **[12]**

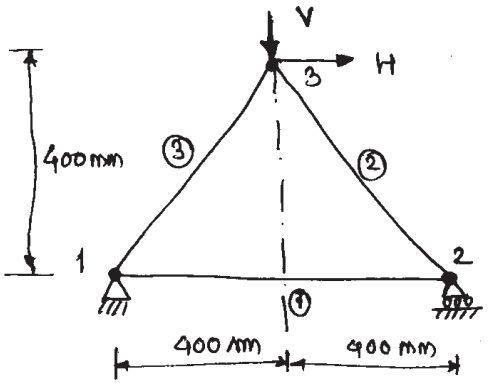
$Q_1 = 0,\ Q_2 = 135°,$

$Q_3 = 45°$

E = 200 GPa

$A_1 = 1500\ mm^2$

$A_2 = A_3 = 2000\ mm^2$



b) List down 2D elements and explain one in brief. **[4]**

Q7) a) Explain Axisymmetric Element with practical example. **[8]**

b) Write a note on plane stress element and give one practical example. **[8]**

Q8) a) What is shape function? Explain use of polynomial is shape function derivation. **[8]**

b) Explain Pascal triangle and its significance. **[8]**

Q9) a) Write a note on Neutral files used in CAD interfacing. **[8]**

b) Derive stiffness matrix for 2D truss element **[8]**

Q10) Explain any three : **[18]**

a) Linear Strain Triangle

b) Constant Strain Triangle

c) Isoparametric Element

d) P-Refinement and H-Refinement

Total No. of Questions : 8]

SEAT No. :

P2230

[Total No. of Pages : 2

[4660]-177

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

ADVANCED HYDRAULICS & PNEUMATIC SYSTEMS

(Elective - I) (2008 Pattern) (Semester - I) (502302(c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Name different components of a hydraulic brake system. What are their functions? **[6]**

b) Enlist the type of hydraulic fluids. Explain the factors affecting the performance of oil used in hydraulic system. **[6]**

c) Explain the role of heat exchanger in hydraulic system. **[6]**

Q2) a) Explain pump performance characteristics and its testing procedure. **[8]**

b) Explain how accumulators can be used in automobiles? Draw a circuit diagram to show one such application. **[8]**

Q3) a) Explain with a hydraulic circuit diagram, the controlling of a power holding device used in automobiles. **[8]**

b) Explain the compressed air generation and distribution system used in a plant. **[8]**

Q4) a) What are the efficiencies in a hydraulic power pack. **[8]**

b) Explain the pressure compensated vane pump. **[8]**

P.T.O.

SECTION - II

Q5) a) What are the advantages of pilot operated systems? Explain any typical pilot operated pneumatic circuit. **[8]**

b) Explain the solenoid operated 5/2 DCV used in pneumatic system. **[8]**

Q6) a) What is synchronizing of cylinders? What are the different methods of synchronizing of cylinders? Which method of synchronizing is efficient? **[8]**

b) What are the basic fluidic devices used in fluidic logic control systems? **[8]**

Q7) a) What is a dual pump? Explain with a circuit diagram the application of a dual pump. **[8]**

b) Explain a typical set-up to test a pressure relief valve. **[8]**

Q8) Answer any three of the following: **[18]**

a) Explain the pneumatic - safety system.

b) Describe MPL Control System.

c) Sequencing of actuators.

d) FRL unit.

e) Air Motor.

Total No. of Questions : 10]

SEAT No. :

P2231

[Total No. of Pages : 2

[4660] - 178

M.E. (Mechanical) (Automotive Engineering)

a- TRIBOLOGY AND PREVENTIVE MAINTENANCE

(2008 Pattern) (Elective - II) (502303)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Derive the two dimensional Reynolds equation from the first principle. Write the assumptions of Reynolds equation. **[18]**

Q2) a) Differentiate between Hydrodynamic bearing and Hydrostatic bearing. **[8]**

b) Explain the effect of temperature and pressure of viscosity of lubricating oil. **[8]**

Q3) a) State the different ways of the disposal of used oils. **[6]**

b) Using deformation theory, derive the equation for coefficient of friction due to deformation with usual notations. **[10]**

Q4) a) What is surface fatigue wear? Where it is observed?

b) Explain ‘‘Junction Growth Theory’’.

c) List the causes of friction.

d) Explain Stick Slip phenomenon.

[16]

P.T.O.

Q5) a) Explain the mechanism of pressure development in hydrodynamic lubrication. **[8]**

b) Explain the following properties of lubricants in brief: **[8]**

i) Viscosity

ii) Viscosity Index

iii) Alkalinity

iv) Demulsibility

SECTION - II

Q6) a) Explain Tilting pad journal bearing with neat sketch. **[8]**

b) Explain the basic concept and application of Elasto-hydrodynamic lubrication. **[8]**

Q7) a) State considerations while selecting a lubricant for metal working. **[8]**

b) Explain merits, demerits and application of gas lubricated bearing. **[8]**

Q8) a) What do you understand by squeeze film lubrication? **[6]**

b) Derive Hertz equations for deformation and pressure. **[10]**

Q9) a) What do you understand by preventive maintenance? How is it different from corrective maintenance?

b) Explain maintenance schedule for passenger cars.

c) Write short note on greasing of vehicles.

[18]

Q10) Explain in detail: **[16]**

a) Maintenance of drive line system.

b) Maintenance of electrical systems.

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Total No. of Questions : 10]

SEAT No. :

P2232

[Total No. of Pages : 3

[4660] - 179

M.E. (Mechanical) (Automotive Engineering)

b: AUTOMOTIVE SAFETY AND REGULATIONS

(2008 Course) (Semester - I) (Elective - II) (502303)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the terms ''Active safety system and Passive safety systems''. Give suitable example of each. **[8]**

b) Describe various steps involved in crash testing of vehicle. What parameters are studied in crash test? Discuss in detail. **[8]**

Q2) a) Why road safety is important? What are various causes of road accidents? Explain. **[8]**

b) Explain ''injury measurement and criteria'' for human body undergone with impact during accidents. What is injury rating? Explain. **[8]**

Q3) a) Describe various causes for occupant injury. Which parts of human body are affected by injury? Explain. **[8]**

b) Describe various design requirements for crash test dummies. **[8]**

Q4) a) Explain role for ergonomics in vehicle safety. **[8]**

b) Explain with example what do you understand by occupant restraint system? Describe it with neat sketch? **[8]**

P.T.O.

Q5) Write short note on following (Any three) **[18]**

a) Instrumentation in crash testing.

b) Evolution of safety systems.

c) Anthropometry data for automobile occupancy.

d) Under run protection device.

SECTION -II

Q6) a) What are types of automobile seats? Explain with neat sketch construction of front seat? **[8]**

b) What are the functions of car bumper? Explain various requirements of crashworthiness of it. **[8]**

Q7) a) Describe role of side door intrusion beam in providing passive safety in cases of side impacts. **[8]**

b) Explain role of automobile seat anchorage. **[8]**

Q8) a) Explain briefly construction and working principle of head lamp used in automobile. **[8]**

b) What testing procedure is followed for lamps and reflectors in automotive testing laboratory? **[8]**

Q9) a) Draw neat sketch of specifying dimensions and color code as per motor vehicle act 1988 for following signs. **[8]**

i) No entry or straight prohibited.

ii) Right turn prohibited.

iii) Cross road.

iv) Parking both sides.

b) Explain briefly what procedure to be followed for passing a permit of commercial vehicles by regulatory authority RTO. **[8]**

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

a) Role of seat belt in protection against whiplash injury.

b) Adoptive front lighting system.

c) Testing track for vehicle.

d) Types of rear view mirrors.

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Total No. of Questions : 8]

SEAT No. :

P2743

[Total No. of Pages :2

[4660]-18

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

a -THRUST AREAS IN PROJECT MANAGEMENT

(2008 Course) (Semester-II) (Elective-IV) (Open) (501112)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) Compare PDRI for industrial buildings with the PDRI for residential buildings. Discuss advantages of using PDRI in the project pre-planning process. Draw a flow diagram representing the complete process of project pre-planning. **[6+6+6]**

Q2) Compare and contrast between ISO 9001 and ISO 9004. In the context of the TQM, which ISO is preferred? Why? Explain. Discuss " Documentation and Control of Records" in the context of ISO 9001; with proper examples from a construction organisation. **[4+4+8]**

Q3) Discuss advantages of PEB over other types of building construction methods. With a flow diagram explain the complete process of adopting PEB technology. **[8+8]**

Q4) Schematically, explain the concept of the " fast track construction". Discuss the risks and returns associated with the above method. Explain concept of "GMP" with an example. **[4+8+4]**

P.T.O

SECTION-II

Q5) Explain the 4 types of relationships as classified between the client and the contractor. Discuss the positives / negatives associated with each relationship. Discuss the merits of project partnering concept with a case study. **[8+2+8]**

Q6) Conduct a SWOT analysis for the present status/ conditions w.r.t the "Indian Infrastructure Development" in detail and document the results in the format of the SWOT matrix. Discuss the advantages of conducting the SWOT analysis. **[12+4]**

Q7) Elaborate the roles of the following human resources appointed by a reputed contracting firm and discuss the various competencies required for performance of each role effectively.

a) Project Manager.

b) Senior Engineer (Quality Control and Assurance) **[8+8]**

Q8) Discuss the following: **[4+4+4+4]**

a) Skills Development program of HRD ministry.

b) Lasseiz Fairre format of leadership.

c) Project Influence – Cost relationship over the life cycle.

d) Competancy mapping and assessment.

□□□□

Total No. of Questions : 8]

SEAT No. :

P3263

[Total No. of Pages : 2

[4660] - 180
M.E. (Mechanical -Automotive)
AUTOMOBILE AIR CONDITIONING
(2010 Course) (Elective - II) (Semester - I) (502303 C)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain Bell Coleman cycle. Derive the expression for COP of Bell Coleman cycle. **[8]**

b) List the various psychrometric processes. Present the analysis of any two process with schematic diagram and psychrometric chart. **[8]**

Q2) a) Discuss the various refrigerants for automotive air conditioning. Explain its characteristics. **[8]**

b) Classify the compressors used in refrigeration systems. What is the selection criteria for compressor in automotive air conditioning? **[8]**

Q3) A minibus with seating capacity of 18 passengers is to be maintained at 24 ^{o}C DBT and 50% RH. The outdoor conditions are 38 ^{o}C DBT and 27 ^{o}C WBT. With appropriate assumptions do the cooling load calculations for minibus and determine GTH.

If the cooling coil surface temperature is maintained at 10^{o}C and coil BF is 0.15. Determine air supply temperature, cmm of air, and SHF for cooling coil. **[18]**

P.T.O.

Q4) a) With neat schematic, explain air conditioning system for passenger cars. **[10]**

b) Explain the equal friction method for duct design. **[6]**

SECTION - II

Q5) a) Explain how the supply and return air outlets are selected for an air conditioning system. **[8]**

b) A 15 m long duct passes air at the rate of 1.5 m^3/s. If the friction factor is 0.005, calculate the pressure drop in the following cases: **[8]**

i) when the duct is circular of diameter 300 mm

ii) when the duct is of 300 mm square section

iii) when the duct is of 400 mm × 250 mm cross section

Q6) a) What is infiltration and ventilation loads? How these loads are calculated during cooling load estimation? **[8]**

b) Classify the air conditioning systems. Explain any one in detail. **[8]**

Q7) a) What are the various types of filters used in an air conditioning systems?

Explain HEPA filter in detail. **[8]**

b) What are the common troubles found in automobile air conditioner? Discuss the possible remedies for the same. **[8]**

Q8) Write short note on any three: **[18]**

a) Fan characteristics curve.

b) Sound control in air condition systems.

c) VAV air conditioning system.

d) Air washer.

Total No. of Questions : 8]

SEAT No. :

P3309

[Total No. of Pages :2

[4660] - 181

M.E. (Mechanical) (Automotive Engg.) (Semester - II)

AUTOMOTIVE FUELS AND EMISSIONS

(2008 Pattern)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Determine enthalpy of combustion of gaseous propane at 25°C and 1 atm. Using enthalpy of formation data. **[10]**

hf (CO_2) = – 393520 kJ/Kmole

hf (H_2O) = – 285830

hf (Propane) = – 103850 kJ/Kmole

b) What is enthalpy of combustion? How does it differ from the enthalpy of reaction? **[6]**

Q2) a) Explain normal and abnormal combustion in SI engine. **[8]**

b) Discuss following terms in connection with surface ignition. **[8]**

i) Run on

ii) Run away

iii) Wild ping

iv) Rumble

Q3) a) Discuss different properties of ethanol and methanol and compare them with gasoline. Why blends of either ethanol or methanol are preferred over pure alcohol fuels. **[10]**

b) Describe the changes required to be made in diesel engine to run on CNG fuel. **[6]**

P.T.O.

Q4) Write short notes on : **[18]**

a) Octane and Cetane rating.

b) Fugacity and Activity.

c) Chemical equilibrium.

SECTION - II

Q5) a) What are the bad effects of emissions on human health, animals and crops? **[10]**

b) Discuss in detail greenhouse gas emissions. **[6]**

Q6) a) Explain and compare two way catalytic converter, three way catalytic converter and Noble metal catalytic converter. **[8]**

b) Explain emissions and drivability in case of petrol as well as diesel engines. **[8]**

Q7) a) What are the main constituents of exhaust emission from petrol engines? Discuss the various factors affecting the exhaust emission? **[10]**

b) Discuss the emissions from diesel engines and explain briefly how it can be controlled. **[6]**

Q8) Write notes on : **[18]**

a) BS III and BS IV norms.

b) Charcoal Canister Control for Evaporative Emission Control.

c) Emission inventory.

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P3419

[Total No. of Pages : 2

[4660] - 182
M.E. (Mechanical Engineering)
AUTOTRONICS
Automotive Engineering
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain what is meant by Engine Management System List down the components of EMS. **[8]**

b) Write a note on Vehicle Motion Control. **[8]**

Q2) a) Explain principle of operation of crank angle position sensor. **[8]**

b) Write a note on Vehicle speed sensors. **[8]**

Q3) a) What is meant by MPFI and its advantageous over convention fuel injection. **[8]**

b) Why spark timing is important and how electronic spark timing is achieved? **[8]**

Q4) a) Why warm up control is important and how it is achieved? **[8]**

b) Write a note on on-board diagnostics. **[8]**

P.T.O.

Q5) Write a Note on any three : **[18]**

a) Detonation Sensors.

b) Electronic Management of Chasis System.

c) Engine Control Unit.

d) Exhaust Emmission Control.

SECTION - II

Q6) a) Significance of mirros in Safety of Automobile. Explain. **[8]**

b) List down dash board instruments and explain in brief. **[8]**

Q7) a) Explain working of Cruise Control System. **[8]**

b) Explain "Significance of seat belts in Automotive safety". **[8]**

Q8) a) How sensors and actuators are integrated in Automotive Control System, Explain with appropriate block diagram. **[9]**

b) Write a note on digital control system used in Automotive. Explain advantageous over conventional control system. **[9]**

Q9) a) Explain How electromagnetic compatibility is achieved in dash board instruments. **[8]**

b) Write a note on Security and warning system in Automotibles. **[8]**

Q10) Solve any three : **[16]**

a) Automotive telematics.

b) Airbag System.

c) D.C. Generator and Alternator.

d) Starter Motor.

Total No. of Questions :8]

SEAT No. :

P3264

[Total No. of Pages :2

[4660]-183

M.E. (Mechanical) (Automotive Engineering)
FUNDAMENTALS OF VEHICLE DYNAMICS
(2008 Course) (Semester - II) (502308)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Que. Nos. 4 & 8 are compulsory. Attempt any two questions from Q. No. 1, 2, 3 & any two questions from Q. No. 5, 6, 7.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION -I

Q1) a) What do you understand by ride perception and what are the ride excitation sources. **[6]**

b) The sprung parts of a passenger car weigh 9.5 kN and the unsprung parts weigh 850 N. The combined stiffness of the suspension springs is 41.5 kN/m and that of the tires is 551.3 kN/m. Determine the two natural frequencies of bounce motion of the sprung and unsprung mass. **[10]**

Q2) A vehicle is treated as two degree freedom system in bounce and pitch mode. The mass of the vehicle is 1350 kg and its radius of gyration is 1.3 m. The stiffness of the front suspension is 135 kN/m and that of rear suspension is 155 kN/m. Center of gravity of the vehicle is 1.4 m from front, 1.2 m from rear wheel and 0.6 m above ground. Find the natural frequencies and mode shapes. **[16]**

Q3) Explain constant radius and constant speed test for determining handling characteristics of vehicle. **[16]**

P.T.O.

Q4) Write short notes: **[18]**

a) ISO Standard for Human Response to vibrations.

b) Characteristic and Critical speeds.

c) Natural frequency and damping in yaw.

SECTION -II

Q5) A passenger car weighs 19 kN and has a wheelbase of 2.5 m. The CG is 1.2 m behind the front axle and 0.53 m above ground level. The braking effort distribution on the front axle is 65%. The coefficient of rolling resistance is 0.017. Determine which set of the tires will lock first on two road surfaces: one with a coefficient of road adhesion $\mu = 0.83$, and the other with $\mu = 0.23$. **[16]**

Q6) A front engine vehicle has a mass of 1900 kg and a wheelbase of 2.5 m. The distance between the center of gravity of the vehicle and the front axle is 1.2m. The cornering stiffness of each of the front tires is 40 kN/rad and that of the rear tires is 38 kN/rad. The average steering gear ratio is 20. Determine the yaw velocity gain and the lateral acceleration gain of the vehicle with respect to the steering wheel angle for speed upto 100 km/hr. **[16]**

Q7) A quarter car vehicle model has a mass of 275 kg stiffness of suspension spring is 41 kN/m, damping factor 0.63. The road profile is approximated as sine wave of amplitude 55 mm and wavelength 1.8 m estimate **[16]**

a) Critical speed of the vehicle

b) Amplitude of steady state motion of vehicle mass when vehicle is driven at critical speed

c) Amplitude of steady state motion of mass when the vehicle is driven at 40 km/hr.

Q8) Write short notes on: **[18]**

a) Automobile suspension modelled as single dof system and its applicability.

b) Acceleration response of road vehicle in yaw.

c) Force-speed response of damper.

EEE

Total No. of Questions : 10]

SEAT No. :

P3265

[Total No. of Pages :3

[4660]-184

M.E. (Mech.-Automotive)

NOISE, VIBRATIONS AND HARSHNESS

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

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) What are the different interior noise sources in vehicle? **[8]**

b) Describe the different types of accelerometer mounting for vibration measurements with their advantages and disadvantages. **[8]**

Q2) a) Explain propagation of sound, reflection of sound, absorption of sound and refraction of sound? **[8]**

b) A simply supported beam of 1 m length and 50 mm in diameter is carrying a mass 100 kg at a distance of 0.25 m from one end. Find the natural frequency of transverse vibrations. Assume Young's modulus of beam material as 250GN/m^2. **[8]**

Q3) a) Explain the Pass by Noise measurement technique of Vehicle. **[8]**

b) Explain Sound power level and sound intensity level. **[8]**

P.T.O.

Q4) a) Explain effect of noise on human beings and what are noise specifications for generator sets, fire crackers and household articles. **[8]**

b) Explain why noise source identification is required and what the different methods are available? **[8]**

Q5) Write short notes on any three of the following: **[18]**

a) Importance of NVH.

b) Digital Signal Processing.

c) Noise Dose Meter.

d) Sound intensity probe P-P.

SECTION-II

Q6) a) Explain in detail different sound fields and state its significance. **[8]**

b) What do you mean by sound intensity mapping? What is its significance in NVH? **[8]**

Q7) a) Frequency spectrum analysis of the noise output of the machine using one-octave band pass filters gave the following results: **[8]**

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?

b) Explain Structure borne noise and Air borne noise in car. **[8]**

Q8) a) Explain Autocorrelation, Cross correlation, Auto spectrum, Cross spectrum. **[8]**

b) What do you mean by Modal Analysis? What are the different parameters are obtained by Experimental Modal analysis and explain their significance. **[8]**

Q9) a) What are the Different types of Sound Absorbers are used? **[8]**

b) Explain the working of Helmholtz resonator type Muffler. **[8]**

Q10) Write short notes on any three of the following: **[18]**

a) Sound insulation.

b) Acoustic Holography.

c) Anechoic chamber and Reverberation chamber.

d) Beam forming technique.

□□□□

Total No. of Questions : 8]

SEAT No. :

P3310

[Total No. of Pages :2

[4660] - 185
M.E. (Mech. Automotive) (Semester - II)
AUTOMOTIVE MATERIALS
(Elective - III) (2008 Pattern)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

Solve any three questions in Section - I and Section - II.

SECTION - I

Q1) a) Describe effect of following alloying elements on properties of steel. **[6]**

i) Chromium

ii) Nickel

iii) Tungsten

b) Describe properties and applications of important Titanium alloys used in automotive engineering. **[6]**

c) Write short note on 'Use of Aluminium alloys in automotive engineering'. **[6]**

Q2) a) What is significance of TTT diagram? How TTT diagram for AISI 1080 steel is plotted? Draw this diagram with all details. **[8]**

b) Compare carburising and nitriding processes. Write applications of these processes in automotive engineering. **[8]**

Q3) a) Write short note on 'Manufacturing of Aluminium alloys'. **[8]**

b) List the components used in automobile industries which are manufactured by powder metallurgical technique. Write details of steps involved in manufacturing of any one such component by powder metallurgical technique. **[8]**

Q4) a) Write properties and applications of following engineering polymers. **[8]**

i) PMMA

ii) PTFE

iii) ABS

iv) Phenol formaldehydes

P.T.O.

b) Write down list of metal matrix composites and ceramic matrix composites used in automotive engineering. Describe any one of them in detail. **[8]**

SECTION - II

Q5) a) Compare compression moulding and reaction injection moulding method to manufacture plastic components. Describe Reaction Injection moulding process. **[8]**

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

i) Sound Insulating materials.

ii) Automotive glasses

Q6) a) What is the philosopy used in design against fracture of materials? Describe crack propogation modes in materials. **[8]**

b) List methods use to prevent corrosion. Describe one of them in details. **[8]**

Q7) a) Differentiate between testing and characterization of materials. Write short note on TQM. **[8]**

b) Which mechanical properties are important in selecting material for spring. List some of the materials used for springs in automotive engineering. **[8]**

Q8) a) What are antifreeze engine coolants? List antifreeze engine coolants and describe their mechanism of working. **[6]**

b) Write details of design considerations in selection of materials for following automotive components. **[12]**

i) Cylinder head

ii) Piston ring

iii) Clutch Plate

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Total No. of Questions : 8]

SEAT No. :

P3311

[Total No. of Pages : 2

[4660] - 187
M.E. (Mechanical) (Automotive Engineering)
COMPUTATIONAL FLUID DYNAMICS
(2008 Pattern) (Theory)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) For a fluid flow, derive from the first principles.

a) The differential form of the continuity equation. **[6]**

b) The differential form of the momentum equation. **[12]**

Q2) Present the algorithm for Alternating Direction Implicit (ADI) scheme for solving two dimensional transient heat conduction equation. What is the main advantage of this scheme? **[16]**

Q3) a) Write a short note on unstructured meshes. **[8]**

b) How are the partial differential equations classified mathematically? Give example of each type. **[8]**

Q4) For one dimensional transient conduction, formulate the finite difference equation in implicit form, explicit form and Crank Nicholson form. **[16]**

SECTION - II

Q5) Explain

a) The Lax - Wendroff Technique **[9]**

b) MacCormack's Technique **[9]**

P.T.O.

Q6) Describe pressure correction method for solution of Incompressible Couette Flow. **[16]**

Q7) Present the algorithm for CFD solution of subsonic - supersonic isentropic nozzle flow. **[16]**

Q8) Describe the numerical solution of Prandtl - Meyer expansion wave flow field. **[16]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P3266

[Total No. of Pages : 2

[4660] - 188

M.E. (Mechanical-Automotive Engineering)

AUTOMOTIVE CHASSIS DESIGN

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

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the general characteristics of a vehicle suspension system? What conditions must be satisfied in suspension of a modern day car. Explain with the help of neat sketches. **[8]**

b) Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6mm. Assume aspring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, G = 84 kN/mm^2.

Neglect the effect of stress concentration. Draw a fully dimensioned sketch of the spring, showing details of the finish of the end coils. **[8]**

Q2) a) Explain with the help of neat sketches different types of steering column. **[8]**

b) Describe with the help of sketches, working of independent wheel suspension system of a modern car dealing with high acceleration, peak speed and high cornering speed. **[8]**

Q3) a) With the help of neat diagram explain the working and construction of disc brake. **[8]**

b) Explain with the help of neat sketch servo-power assisted braking systems. **[8]**

P.T.O.

Q4) Write short note on the following (Any three). **[18]**

a) Active suspension.

b) Variable rate spring.

c) Steering characteristics.

d) Apportioning Valve.

SECTION - II

Q5) a) Explain with the help of neat sketch vacuum brakes. **[8]**

b) Why brake shoe adjustment is required? Explain Lockheed heavy duty brake adjusting mechanism. **[8]**

Q6) a) What are the advantages and disadvantages of Tubeless Tire with respect to conventional tires? **[8]**

b) Explain tyre construction with help of neat sketch. **[8]**

Q7) a) With the help of neat sketch explain working of six wheeled vehicle. Discuss its application and the method of calculating wheel torque on different wheels. **[8]**

b) Explain spring stresses in rigid six wheelers. **[8]**

Q8) Write short note on the following.(Any three). **[18]**

a) Dual brake.

b) Tread design.

c) Retrading and manufacturing of tyres.

d) Scammell articulated trailer.

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Total No. of Questions : 8]

SEAT No. :

P2233

[Total No. of Pages : 4

[4660] - 190

M.E. (Mechanical) (Energy Engg.)

ADVANCED ENGINEERING MATHEMATICS

(2012 Pattern) (Semester -I) (502501)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Find series solution of differential equation $(1+x^2)\frac{d^2y}{dx^2}+x\frac{dy}{dx}-y=0$. **[9]**

b) With usual notation for Bessel's polynomial prove that

i) $J_{-n}(x)=(-1)^n J_n(x)$. **[5]**

ii) $\frac{d}{dx}\left[x^n J_n(x)\right]=x^n J_{n-1}(x)$. **[4]**

Q2) a) Use method of Frobenius to find solution of differential equation **[8]**

$8x^2y''+10xy'-(1+x)y=0$

b) With usual notations prove that $J_{y_2}(x)=\sqrt{\frac{2}{\pi x}}\sin x$. **[8]**

P.T.O.

Q3) a) Prove following recurrence relation for Legendre's polynomials. **[8]**

i) $(2n+1)\,x\,p_n(x) = (n+1)p_{n+1}(x) + n\,p_{n-1}(x)$

ii) $n\,p_n(x) = x\,p_n'(x) - p_{n-1}'(x)$

b) Find the eigen values and eigen functions of Stram-Liouvilles problem where real number $\lambda > 0$, & $y'' + \lambda y = 0,\ y(0) = 0,\ y'(\pi) = 0$. **[8]**

Q4) a) Explain D' Alembert method for finding solution of wave equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ subject to **[8]**

i) $u(x, 0) = f(x)$

ii) $u_t(x, 0) = g(x)$

b) A rectangular plate with insulated surface is 10cm wide and so long compared to its width that it may be considered infinite in length without introducing an appreciable error. If the temperature of short edge $y = 0$ given by $u = \begin{cases} 20x & \text{, for } 0 \le x \le 5 \\ 20(10 - x), & \text{for } 5 \le x \le 10 \end{cases}$

and two long edges $x = 0$, $x = 10$ as well as other short edge are kept 0^oC, prove that the temperature u at any point (x, y) is given by

$$u = \frac{800}{\pi^2} \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{(2n-1)^2} \sin \frac{(2n-1)\pi x}{10}\, e^{-\frac{(2n-1)\pi y}{10}} .$$ **[8]**

SECTION - II

Q5) a) Find Fourier series expansion of $f(x) = |x|,\ -\pi < x < \pi$ and hence show that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots\ldots$ **[9]**

b) A rod of length l with insulated sides is initially at a uniform temperature u_o. Its ends are suddenly cools to 0^oC and are kept at that temperature. Find The temperature function $u(x,t)$. **[9]**

Q6) a) Using inverse Fourier sine transform, find $f(x)$ if $F_s(\lambda) = \frac{e^{-a\lambda}}{\lambda}$. **[8]**

b) Define

i) Linear Transform

ii) Regular Transform

If $T: R^3 \to R^2$ is defined by $T(x, y, z) = (x + y + z, 2x + 3y + z)$, show that T is linear transform. Justify your answer. **[8]**

Q7) a) If $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ represent the vibrations of a string of length l fixed at both ends, find the solution with boundary conditions. **[8]**

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

ii) $u(l, 0) = 0$

iii) $\left(\frac{\partial u}{\partial t}\right)_{t=0} = 0$

iv) $u(x, 0) = k\left(lx - x^2\right),\ 0 \le x \le l.$

b) Explain with examples. **[8]**

i) Contravariant tensor

ii) Covariant tensor

iii) Mixed tensor

Q8) a) Use Fourier transform to solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, 0 < x < \infty, + > 0$

subject to **[8]**

i) $\left(\frac{\partial u}{\partial x}\right)_{x=0} = 0,\ t > 0$

ii) $u(x, 0) = \begin{cases} x, \text{ if } 0 < x < 1 \\ 0, \text{ if } x > 1 \end{cases}$

iii) $|u(x, t)| < \mathrm{M}$

b) Show that every tensor can be expressed as the sum of a symmetric and skew- symmetric tensors in pair of covariant and contravariant indices. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P3313

[Total No. of Pages : 4

[4660] - 192
M.E. (Mechanical) (Energy Engineering)
ENERGY CONVERSION SYSTEMS
(2008 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Write classification of energy sources. **[8]**

b) Write a short note on pressure velocity compounding. **[8]**

Q2) a) At a location for a hydroelectric plant, the head available (net) was 335 m. The power availability with an overall efficiency of 86% was 15500 kW. The unit is proposed to run at 500 rpm. Assume Cv = 0.98, φ = 0.46, Blade velocity coefficient is 0.9. If the bucket outlet angle proposed is 165°. Check for the validity of the assumed efficiency. **[8]**

b) An open cycle gas turbine is equipped with intercooling, reheat and regeneration arrangement. The H.P. turbine is used for compressor drive and L.P. turbine for output. The specific output of the installation is 150kW/kg/s and overall thermal efficiency of 32%. The following data refer to this installation.

Pressure ratio in each compressor stage = 3, Isentropic efficiency in each compressor stage = 0.87, Isentropic efficiency in H.P. turbine = 0.87, Isentropic efficiency in L.P. turbine = 0.82, Pressure loss in air side of heat exchanger = 6% of entry pressure, Pressure loss in intercooler = 3% of

P.T.O.

entry pressure, Pressure loss in reheater = 6% of entry pressure, Turbine inlet temperature (for both) = 1030K, Atmospheric temperature = 288K, H.P. compressor inlet temperature = 298K,

Calculate the permissible pressure drop on the gas side and effectiveness of heat exchanger. Also calculate the mass flow rate of the air required to produce 60MW. **[8]**

Q3) The following are the data collected for a boiler using coal as the fuel. Find out the boiler efficiency by indirect method. **[16]**

Fuel firing rate = 5599.17 kg/hr

Steam generation rate = 21937.5 kg/hr

Steam pressure = 43 $kg/cm^2(g)$

Steam temperature = 377 °C

Feed water temperature = 96 °C

%CO_2 in Flue gas = 14

%CO in flue gas = 0.55

Average flue gas temperature = 190 °C

Ambient temperature = 31 °C

Humidity in ambient air = 0.0204 kg / kg dry air

Surface temperature of boiler = 70 °C

Wind velocity around the boiler = 3.5 m/s

Total surface area of boiler = 90 m^2

GCV of Bottom ash = 800 kCal/kg

GCV of fly ash = 452.5 kCal/kg

Ratio of bottom ash to fly ash = 90:10

Fuel Analysis (in %)

Ash content in fuel = 8.63

Moisture in coal = 31.6

Carbon content = 41.65

Hydrogen content = 2.0413

Nitrogen content = 1.6

Oxygen content = 14.48

GCV of Coal = 3501 kCal/kg

Q4) Attempt any three : **[18]**

a) The outer diameter of a Francis runner is 1.4 m. The flow velocity at inlet is 9.5 m/s. The absolute velocity at the exit is 7 m/s. The speed of operation is 430 rpm. The power developed is 12.25 MW, with a flow rate of 12 m^3/s. Total head is 115 m. For shockless entry determine the angle of the inlet guide vane. Also find the absolute velocity at entrance, the runner blade angle at inlet and the loss of head in the unit. Assume zero whirl at exit. Also fluid the specific speed.

b) The head available at a location was 1500 m. It is proposed to use a generator to run at 750 rpm. The power available is estimated at 20,000 kW. Investigate whether a single jet unit will be suitable. Estimate the number of jets and their diameter. Determine the mean diameter of the runner and the number of buckets.

c) In an impulse steam turbine, steam is accelerated through nozzle from rest. It enters the nozzle at 9.8 bar dry and saturated. The height of the blade is 10 cm and the nozzle angle is 15°. Mean blade velocity is 144 m/s. The blade velocity ratio is 0.48 and blade velocity coefficient is 0.97.

Find:

i) Isentropic heat drop.

ii) Energy lost in the nozzles and in moving blades due to friction.

iii) Energy lost due to finite velocity of steam leaving the stage.

iv) Mass flow rate.

v) Power developed per stage.

vi) Diagram and stage efficiency. Take: Nozzle efficiency = 92%

Blade angles at inlet = Blade angles at out let Speed = 3000 rev/min.

d) Explain the operating principle of a heat pump with examples.

SECTION - II

Q5) a) Explain capacity of the compressor and various efficiencies of the compressor. **[8]**

b) Describe benefits of Waste Heat Recovery with an example. **[8]**

Q6) a) Write in detail compressed air distribution system. **[8]**

b) Explain in brief flow control strategies in case of fans and types of fans . **[8]**

Q7) a) What is NPSH of a pump and effects of inadequate NPSH? **[8]**

b) List the factors affecting cooling tower performance. And explain types of cooling towers. **[8]**

Q8) Attempt any three : **[18]**

a) Differentiate between fans, blowers and compressors.

b) Explain Steam Turbine Cogeneration systems.

c) Factors affecting selection of Diesel Generating system.

d) Write detail classification of pumps.

Total No. of Questions : 8]

SEAT No. :

P3314

[Total No. of Pages : 2

[4660] - 193

M.E. (Mechanical) (Energy Engineering)

NUCLEAR MATERIALS AND REACTOR FUNDAMENTALS

(2012 Pattern) (Elective - I) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) List and explain four variables typically involved in a reactivity balance. **[8]**

b) Explain why a startup neutron source may be required for a reactor. **[8]**

Q2) 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. **[8]**

b) Why uranium-235 fissions with thermal neutrons and uranium-238 fissions only with fast neutrons? Explain in detail. **[8]**

Q3) a) Explain the fission process using the liquid drop model of a nucleus.**[8]**

b) Describe the curve of Binding Energy per Nucleon versus mass number and give a qualitative description of the reasons for its shape. **[8]**

P.T.O.

Q4) a) State the conservation laws that apply to an elastic collision between a neutron and a nucleus. **[9]**

b) Describe the following processes: **[9]**

i) Alpha decay

ii) Beta-minus decay

iii) Beta-plus decay

iv) Electron capture

SECTION - II

Q5) a) Define the following terms: **[9]**

i) Reactor period

ii) Doubling time

iii) Reactor startup rate

b) Describe the relationship between the delayed neutron fraction, average delayed neutron fraction, and effective delayed neutron fraction. **[9]**

Q6) a) What is the purpose of control rod and moderator in nuclear reactor? Explain various types of control rods and moderators. **[8]**

b) Explain the following terms. **[8]**

i) Burnable poison

ii) Non-burnable poison

iii) Chemical shim

Q7) a) Explain various grades of enriched uranium and their applications. **[8]**

b) What is In-situ leaching? Explain in detail. **[8]**

Q8) a) Differentiate between Boiling water reactor (BWR) Pressurized heavy water reactor (PWR) with neat sketch. **[8]**

b) How nuclear fuel rods are manufactured? Explain in detail. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2234

[Total No. of Pages : 2

[4660] - 198

M.E. (Mechanical) (Energy Engineering)

NON CONVENTIONAL ENERGY SOURCES

(2012 Pattern) (Semester - I) (502505 - C) (Elective - II)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What do you mean by non-conventional energy resources? Discuss Briefly. **[8]**

b) What is insolation? Intensity of solar energy received on earth surface is much less than the intensity with which it is beamed form surface of sun. Discuss various factors responsible for the same. **[8]**

Q2) a) Enumerate the different types of concentrating type collectors. Describe a collector used in power plant for generation of electrical energy. **[8]**

b) Derive the collection efficiency for a cylindrical parabolic concentrator system. **[8]**

Q3) a) What is principle of collection of solar energy used in a non-convective solar pond? Describe a non-convective solar pond for solar energy collection and storage. **[8]**

b) Describe briefly the different methods of producing hydrogen from solar energy. **[8]**

P.T.O.

Q4) Write short notes on any three of the following. **[18]**

a) Solar pumping.

b) Electromagnetic storage

c) Beam and diffuse radiation

d) Components of flat plate collectors.

SECTION - II

Q5) a) What is mean by energy plantation? What are the advantages and disadvantages? **[8]**

b) Describe the factors affect the size of biogas plant. Describe the materials used for biogas generation. **[8]**

Q6) a) What are the advantages of vertical axis machines over horizontal type? Describe a rotor for relatively low velocity wind. **[8]**

b) Derive the expression for maximum power developed due to wind. **[8]**

Q7) a) Describe the characteristics of materials used for different components of power plant utilizing the geothermal energy. **[8]**

b) With the help of neat diagram explain the construction, working and characteristics of a vapor dominated geothermal power plant. **[8]**

Q8) Write short notes on any three of the following. **[18]**

a) Prospects of Geothermal energy in context to India.

b) Savonius rotor.

c) Wet fermentation and dry fermentation.

d) Sources of geothermal pollution.

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Total No. of Questions : 8]

SEAT No. :

P3315

[Total No. of Pages : 2

[4660] - 199

M.E. (Mechanical) (Energy Engg.) (Semester - II)

CONVECTIVE HEAT TRANSFER

(2012 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain methods to find heat transfer coefficient practically in convection. **[8]**

b) Using dimensional analysis establish a relation between Nusselt, Prandtl and Grashof numbers. **[8]**

Q2) a) A long 20cm diameter cylindrical shaft made of stainless steel 304 comes out of an oven at a uniform temperature of 600 °C. The shaft is then allowed to cool in an environment chamber at 200 °C with an average heat transfer coefficient of 80 W/m^2 °C. Determine the temperature at the center of the shaft 45 min after the start of the cooling process. Also, determine the heat transfer per unit length of the shaft during this time period. (k = 14.9 W/m-K, Cp = 477 J/kgK, p = 7900 kg/m^3). **[10]**

b) Explain Combined Forced and Free Convection mode of heat transfer. **[6]**

Q3) a) Derive the differential form of convection continuity equation. **[8]**

b) Explain physical significance of dimensionless terms in convection. **[8]**

P.T.O.

Q4) Write a short note (Any Three) : **[18]**

a) Combined Convection and Radiation in Flows

b) Single Phase Forced Convection in Micro-channels

c) Gas Flow in Micro-channels

d) Physical mechanism of boundary layer development over flat surface and circular tubes

SECTION - II

Q5) a) Explain in detail flow boiling in vertical tube under forced convection. **[8]**

b) Explain advantages and applications of micro-channel heat transfer. **[8]**

Q6) a) A horizontal steam pipe of diameter 20cm runs through a large room and is exposed to air at a temperature of 20°C. The pipe surface temperature is 180°C. Find the flow of heat per meter length of the pipe by convection and radiation. Take emissivity of pipe surface as 0.8, Use correlation. $Nu = 0.53\ (Gr.Pr)^{1/4}$. **[8]**

b) Derive equation for counter flow heat exchanger using LMTD method. **[8]**

Q7) a) Explain forced convection Boiling in detail. **[8]**

b) Explain film-wise drop-wise condensation and their correlations. **[8]**

Q8) Write a note (Any Three) : **[18]**

a) Atmospheric and Solar radiation.

b) Pool Boiling Curve.

c) Micro-channel heat sinks.

d) Micro Heat Pipes and it's applications.

Table: Properties of Air

Temperature (°C)	υ (m^2/s)	K (W/mK)	Pr	ρ(Kg/m^3)	Cp(KJ/KgK)
100	23.13×10^{-6}	3.208×10^{-2}	0.688	0.946	1.009

Total No. of Questions : 8]

SEAT No. :

P2235

[Total No. of Pages : 4

[4660] - 200

M.E. (Mechanical) (Energy Engineering)

ENERGY SYSTEMS MODELLING AND ANALYSIS

(2012 Course) (Semester - II) (502509)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Given the data table, fit the polynomial equation of the form $y = ax^2 + bx + c$. **[8]**

x	1	3	4	7
y	1.5	4.5	9.5	25.5

b) Given the data table, estimate value of y at $x = 3.5$ using suitable method. **[8]**

x	0	1	2	3	4
y	10	15	38	79	134

Q2) a) Find the root of the equation $f(x) = 9x^2 + 4x - 10$ between [0 to 3] by any suitable method. **[8]**

b) Explain "Information Flow Diagram" with suitable example. **[8]**

Q3) a) A firm has devided its marketing area into three zones. The amount of the sales depends on number of salesmen in each zone. The firm has been collecting the data regarding sales and salesmen in each area over a number of past years. The information is summarized in the table. For the next

P.T.O.

year firm has only nine salesmen and the problem is allocate these salesmen to three different zones so that total salesmen are maximum. **[8]**

No. of Sales men	Profit in Thousands of Rs.		
	Zone 1	Zone 2	Zone 3
0	30	35	42
1	45	45	54
2	60	62	60
3	70	64	70
4	79	72	82
5	90	82	95
6	98	93	102
7	105	98	110
8	100	100	110
9	90	100	110

b) Use Kuhn-Tucker conditions to solve following nonlinear programming problem. **[8]**

Maximize $Z = 7x^2 - 6x + 5y^2$

Subject to conditions $x + 2y \leq 10,$

$x - 3y \leq 9,$

$x, y \geq 0.$

Q4) Attempt any three. **[18]**

a) Explain modelling of Heat exchanger (a counter flow heat exchanger).

b) What are the steps in model development?

c) Find value of y at $x = 2.5$.

x	2	3	4	5
y	2	4.5	8	12.5

Use Lagrange Interpolation Method.

d) Maximize $Z = 2x + y$ by using Graphical method

Subject to $x + y \leq 6,$

$x - y \leq 2$

$x - 2y \leq 1$

$x, y \geq 0.$

SECTION - II

Q5) a) Check Sensitivity Analysis for following problem. **[8]**

Maximize $z = 4x_1 + 3x_2 + 6x_3$

Subject to $2x_1 + 3x_2 + 2x_3 \leq 440$

$4x_1 + 3x_2 \leq 470$

$2x_1 + 5x_2 \leq 430$

$x_1, x_2, x_3 \geq 0.$

b) Solve the above problem by using Simplex method. **[8]**

Q6) a) A company wants to design a heat exchanger. Explain your own objectives and constraints for this problem with reason. **[8]**

b) Explain in detail various types of thermal systems. **[8]**

Q7) a) Explain in detail following terms: **[8]**

i) Compound amount factor

ii) Present worth factor

iii) Present worth of money

iv) Future worth of money

v) Inflation

b) Compute $y(0.5)$ using R-K second order method. Take $h = 0.1$. Given

$$\frac{dy}{dx} = 2x^3 + 12x^2 - 20x + 8.5, \; y(0) = 1.$$ **[8]**

Q8) Attempt any three. **[18]**

a) Solve by Euler's method & estimate $y(0.5)$ of the following equation with $h = 0.25$.

$$\frac{dy}{dx} = y + \sin(x), \quad y(0) = 2.$$

b) Explain any two cases on optimization of energy systems in detail.

c) Explain discounted cash flow method and any one energy system.

d) Given the equation $y'(x) = 2y/x$ with $y(1) = 2$. Estimate $y(2)$ by using R-K fourth order method.

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Total No. of Questions : 8]

SEAT No. :

P2665

[Total No. of Pages :2

[4660]-201
M.E. (Mechanical Engineering) (Energy Engineering)
ENERGY MANAGEMENT
(2012 Pattern) (Semester-II) (502510)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain need of energy management. **[8]**

b) Explain the various types of sources of energy in world energy market. **[8]**

Q2) a) What are the three phases of energy audit and explain each phase. **[8]**

b) What are the roles of energy manager and energy auditor in energy management program. **[8]**

Q3) a) Mention the methods of finding efficiency of a boiler? Comment on their merits and limitations. **[8]**

b) What are the losses considered in the direct method? **[8]**

Q4) Write a short note on (any three): **[18]**

a) Energy management team.

b) Energy audit of air compressor.

c) Energy conservation plan for a diary.

d) Instruments used in energy audit.

P.T.O.

SECTION-II

Q5) a) What are different types of Motors? Explain in detail the energy efficiency improvements in Energy Efficient Motors. **[8]**

b) Discuss how selection and location of transformer affect the power factor. **[8]**

Q6) a) Discuss the need for waste heat recovery? **[6]**

b) Give details on the working principle of recuperators with diagram and also mention its applications. **[10]**

Q7) a) Explain in brief about the management of spent fuel. **[8]**

b) Explain in brief: **[8]**

i) Fundamental processes for the evaluation of waste management systems.

ii) Safety assessment waste disposal facilities.

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

a) Efficiency testing of electric motors.

b) Power factor improvement and benefits.

c) Heat pipe.

d) Energy efficient refrigeration system.

□□□□

Total No. of Questions : 8]

SEAT No. :

P2666

[Total No. of Pages :2

[4660]-202
M.E. Mechanical (Energy Engineering)
a-RADIATION SAFETY AND SHIELDING
(2012 Pattern) (Semester-II) (Elective-III) (502511)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Write a note on disposal of radioactive waste. **[8]**

b) Write note on application areas of radiations. **[8]**

Q2) a) What is 'Photon Attenuation' list different techniques to obtain the required X-ray. **[8]**

b) Write a note on natural and man-made radiation sources. **[8]**

Q3) a) What is radiation and explain ionizing radiation? **[8]**

b) Explain control methods for ionizing and non-ionizing radiation. **[8]**

Q4) Write short note on (any three): **[18]**

a) Bragg curve.

b) ALARA and BAT Principle.

c) Equivalent dose and effective dose.

d) Any one Nuclear Disaster in past.

P.T.O.

SECTION-II

Q5) a) What do you mean by radio logical or nuclear emergency? Explain in brief its classification. **[8]**

b) Write note on ‘ surface contamination’. **[8]**

Q6) a) What are different ways to protect against radiation exposure? **[8]**

b) What are principal technical requirement for radiation safety design. **[8]**

Q7) a) Write a note on protection against radiation exposure. **[8]**

b) Write a note on standards of radiation protection. **[8]**

Q8) Write note on (any three): **[18]**

a) Kerma (K).

b) Quality factor.

c) IAEA standards for safety design.

d) Safety principles.

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Total No. of Questions : 8]

SEAT No. :

P3316

[Total No. of Pages : 2

[4660] - 207

M.E. (Mechanical) (Energy Engineering)

PROCESS STORAGE & DISPOSAL OF NUCLEAR WASTE

(2012 Pattern) (Elective - IV) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Which are the sources of nuclear waste? Explain any four. **[8]**

b) Explain Radioactivity and Radio Nuclides. **[8]**

Q2) a) What is Photon Attenuation list different techniques to obtain the required x. **[8]**

b) Explain Long-term behaviour of wastes and containers. **[8]**

Q3) a) Write a note on Indian scenario of nuclear waste management. **[8]**

b) Characterize the radioactive waste approaches to nuclear waste management. **[8]**

Q4) Write short note on (Any Three) : **[18]**

a) Long-Lived Waste Radio Nuclides

b) Short-Lived Waste Radio Nuclides

c) ALARA and BAT principle

d) Process of High Level Waste Handling

P.T.O.

SECTION - II

Q5) a) Explain Hazards of illegal dumping of nuclear waste. **[8]**

b) Write note on 'Surface Contamination'. **[8]**

Q6) a) Write a note on 'Nuclear Waste Regulations'. **[8]**

b) What are Principal technical requirements for radiation safety design. **[8]**

Q7) a) Which are the challenges in nuclear waste management? **[8]**

b) Explain various liquid waste treatment techniques. **[8]**

Q8) Write note on (Any Three) : **[18]**

a) Long term nuclear waste disposal

b) Effect of nuclear waste on environment

c) Protect against radiation exposure before disposal

d) Pre-Treatment of Radioactive wastes

Total No. of Questions : 10]

SEAT No. :

P3268

[Total No. of Pages : 3

[4660] - 209
M.E (Mechanical) (CADME)
ADVANCED MACHINE DESIGN
(2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain in brief the state of strain at a point. **[8]**

b) Derive the expression for Airy's stress function in rectangular coordinate. **[8]**

Q2) a) Explain the maximum elastic strain theory. **[6]**

b) Determine the strain energy release rate for a double cantilever beam with a > > 2h and *l* > > 2h (shown in Fig. 1), where P is the applied load and B is the width of the beam. **[10]**

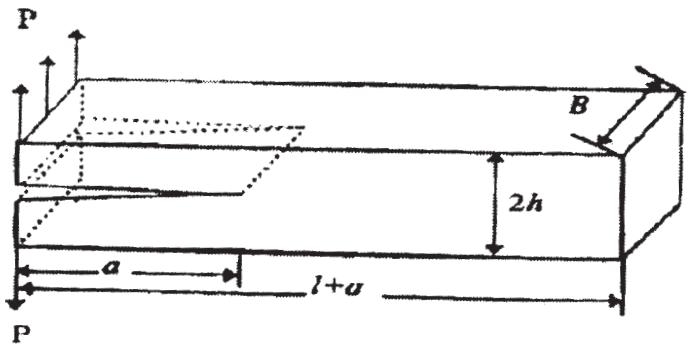

Fig. 1 Double cantilever beam

Q3) a) Explain Castigliano's theorems. **[8]**

b) Explain the concept of energy balance during crack growth? **[8]**

P.T.O.

Q4) a) Explain the significance of theory of failure. **[8]**

b) Explain the Mohr's theory in detail. **[8]**

Q5) Write Short Notes on : **[18]**

a) Octahedral shearing stress theory.

b) Theory of virtual work and energy.

c) Generalized Hooke's Law.

SECTION - II

Q6) a) What is true stress and true strain? Assuming exponential relation for true stress and true strain, derive the expression to estimate time of rupture. **[8]**

b) Following creep data at a certain temperature is known. **[8]**

S_1 = 10.5 MPa ε_1 = 0.012 percent per 1000 hrs

S_2 = 14 MPa ε_2 = 0.025 percent per 1000 hrs

Determine the constants of the hyperbolic sine law and calculate the creep rates for stresses 20 MPa and 28 MPa.

Q7) a) Two 10 teeth gears are to mesh without undercutting. The gears are generated using standard hob with 20^o pressure angle. Module is 4 mm while clearance is 0.2 mm. Using extended centre distance method, Find

i) Hob shift

ii) Blank diameter and depth of cutter setting

iii) Actual pressure angle. **[10]**

Take usual notations.

$\theta = \text{inv}\phi$

$$\phi = \nu - \frac{2}{15}\nu^3 + \frac{3}{175}\nu^5 \text{ Where } \nu = \sqrt[3]{3\theta}$$

θ and ϕ are in radians.

b) Explain interference, undercutting. **[6]**

Q8) a) Discuss the loading and deflection of rubber springs used for simple and cylindrical shear loads. **[8]**

b) Discuss load deflection characteristics for "Belleville spring". State the advantages of these springs. **[8]**

Q9) a) For a graphite epoxy unidirectional lamina, find the following: **[10]**

i) Compliance matrix.

ii) Minor Poisson's ratio.

iii) Strains in the 1-2 coordinate system, if the applied stresses are $\sigma_1 = 2$ Mpa, $\sigma_2 = -3$ MPa, $\tau_{12} = 4$ MPa.

The engineering elastic constants of the unidirectional graphite/epoxy lamina are $E_1 = 181$ GPa, $E_2 = 10.3$ GPa, $v_{12} = 0.28$, $G_{12} = 7.17$ GPa.

b) List out and explain any one Fatigue strength improvement techniques.**[6]**

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

a) Transverse shear effects in composite laminates.

b) Low cycle and high cycle fatigue.

c) Surge in springs.

Total No. of Questions : 8]

SEAT No. :

P3428

[Total No. of Pages : 2

[4660]-211

M.E. (Mechanical) (Computer Aided Design, Manufacturing & Engineering)

COMPUTER AIDED DESIGN

(2012 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) What is synthetic curves? Explain B-Spline curve with its mathematical, graphical features with one example. **[16]**

Q2) How surface is represented mathematically? What are surface entities and its representation? **[16]**

Q3) Explain and represent with application: **[16]**

a) COONS Surface

b) Blending Surface

Q4) About surface manipulation, what are the following concepts? **[18]**

a) Displaying and Segmentation.

b) Trimming, Intersection and Transformation.

P.T.O.

SECTION - II

Q5) How solids are represented? Brief this representation with two methods and its features. Which techniques are used in present software's? **[16]**

Q6) Brief concepts of: **[16]**

a) Algorithm for Shading and Rendering.

b) Feature recognition and Tolerance representation.

Q7) Where collaborative design is used? Explain concept with principles, approaches and its design systems. **[16]**

Q8) Explain the following: **[18]**

a) CAD Database structure

b) Behavioural modeling

c) Product data management

Total No. of Questions : 8]

SEAT No. :

P3470

[Total No. of Pages : 2

[4660]-212

M.E. (Mechanical) (Computer Aided Design, Manufacturing & Engineering)

MATERIALS FOR ENGINEERING APPLICATIONS

(2012 Pattern) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Explain following characterization about one metal and one alloy. **[16]**

a) Tensile and Compressive stress.

b) Stress, Strain relation

c) Wear and abrasion

Q2) What are material properties and applications of **[16]**

a) HSLA Steel

b) Stainless Steel

Q3) Brief the following with their properties and use **[16]**

a) Automobile alloys and aerospace alloys.

b) Metallic Glass.

Q4) What is smart material? List smart materials. Explain in detail quasi crystal and narrow crystalline materials? **[18]**

P.T.O.

SECTION - II

Q5) Explain thermal, electrical, magnetic and optical behaviors of ceramics. What are engineering applications of ceramics? **[16]**

Q6) How composites are classified? What are laws of mixtures? Comment on Young's modules and strength consideration for FRC's and short FRC's.**[16]**

Q7) What are important properties of Fiber glass fiber and Carbon fibers, Aramid fiber and Metallic glass? **[16]**

Q8) How is Meachanical behavior of ceramics? Give ceramic crystal structure in detail. **[18]**

Total No. of Questions : 8]

SEAT No. :

P3441

[Total No. of Pages : 2

[4660]-213
M.E. (Mech.) (CAD/ME) (Semester - I)
ADVANCED MANUFACTURING PROCESSES
(2012 Pattern) (Elective - I (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Question no. 1 & 8 are compulsory and solve any three questions from each section.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right side indicate full marks.***
6) ***Use of Calculator is allowed.***
7) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Using the concept of dynamometry and theoretical considerations, explain how the following can be measured during metal cutting: **[10]**

i) Force measurement.

ii) Heat measurement.

iii) Temperature measurement.

b) Derive the following in relation to orthogonal cutting: **[8]**

i) Shear strain.

ii) Rate of strain.

iii) Total energy consumed per unit volume.

Q2) a) Explain the designation and selection of a grinding wheel. **[8]**

b) Write a note on the following : **[8]**

i) Abrasives ii) Bonding Process

P.T.O.

Q3) a) Differentiate between Pseudo creep-feed & true creep-feed grinding. **[8]**

b) Discuss the effect following parameters on surface finish: **[8]**

i) Wheel speed

ii) Rate of feed

iii) Depth of cut

Q4) a) Give the classification of Forming Processes in detail with its field of applications. **[8]**

b) Explain in detail the parameter which governs the sintering process. **[8]**

SECTION - II

Q5) a) Describe the following terms for EDM process: **[8]**

i) Duty factor

ii) Ignition delay

iii) Dielectric strength

b) Describe in brief the process parameters, tool design and MRR analysis of Ultrasonic Machining process. **[8]**

Q6) a) Write a brief note on the following with concern to High Speed Machining: **[8]**

i) It's Economics.

ii) Historical Elaboration.

b) Justify why Special steels, Super alloys, Aluminum and Titanium alloys are suitable for the Space Industry? **[8]**

Q7) a) Discuss the various Issues related to CAD and GMP software. **[8]**

b) Enlist & discuss the various two dimensional & three-dimensional techniques involved in Rapid Prototyping. **[8]**

Q8) Write short note on: **[18]**

a) Stereo lithio graphy process.

b) Laser beam machining.

c) ECM processes.

Total No. of Questions : 10]

SEAT No. :

P3440

[Total No. of Pages : 3

[4660]-215
M.E. (Mechanical) (CAD/ME)
CAD/CAM PRACTICES IN METAL FORMING
(2012 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the stages involved in modeling of sheet metal parts using the concept of sheet metal features available in CAD software. **[8]**

b) Explain following terminology used in modeling of sheet metal parts using any CAD software **[8]**

i) Heams

ii) Flat pattern

iii) Lofted Bends

iv) Jog Feature

Q2) Short notes (any three) (six marks each) **[18]**

a) Characteristics of low alloy steels.

b) Strain hardening coefficient and its effect on formability.

c) Anisotropy coefficient and its effects in deep drawing process.

d) Significance of slip line field theory in sheet metal forming.

e) Friction and lubrication on surface roughness and die wear.

f) Mechanics of metal working in deep drawing process.

P.T.O.

Q3) a) Explain in detail deformation zone geometry in sheet metal working process. **[8]**

b) Explain the effects of Punch force, blankholder force, draw beads, sheet thickness on formability of sheet. **[8]**

Q4) a) Describe with neat sketch the of different zone in formability diagram of low alloy steel. **[8]**

b) Discuss the role of temperature in metal working process. **[8]**

Q5) a) Explain the press control system in forging equipments. **[8]**

b) Explain flow-slip line theory. **[8]**

SECTION - II

Q6) a) Describe in detail Working principle of Mechanical Press. **[9]**

b) Compare the Mechanical, hydraulic and Pneumatic Press on various aspects. **[9]**

Q7) a) Explain the various factors that is to be considered while designing the deep draw dies. **[8]**

b) Explain term Thining and earing phenomena in deep draw process and factors affecting it. **[8]**

Q8) a) Explain minimum bending radius with suitable diagram. **[8]**

b) A 400 mm long and 2.5 mm thick piece of carbon steel sheet is required to bend at 90° using V–die. Consider yield stress of material as 500N/mm^2 and die opening as 10 times the material thickness. Estimate force required for operation. **[8]**

Q9) a) What is strip layout development. **[4]**

b) Discuss benefits of optimum strip layout with an example. **[6]**

c) Describe Spring back in forming process. **[8]**

Q10) Write short note on following (Any Four): **[16]**

a) Press control mechanism of forging Press.

b) Temperature effect in metal working.

c) Selection of raw material in deep draw process.

d) Calculation of draw ratio

e) Advantages of Hudraulic press

f) Importance of CAD/CAM in sheet metal working.

Total No. of Questions : 10]

SEAT No. :

P3476

[Total No. of Pages : 2

[4660] - 216
M.E. (CADME)
FINITE ELEMENT ANALYSIS
(2012 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Write in detail Rayleigh Ritz method. **[9]**

b) Discuss finite element i.e. geometry of element, its nodes, nodal dof? **[9]**

Q2) Solve the following equation using Galerkin's Method. (Use at least two parameters solution) **[16]**

$$dy / dx = 60(1 + \cos x) - 0.05y, 0 \le x \le 1$$

$$y(0) = 300$$

Q3) Explain in detail shape functions linear and quadratic. **[16]**

Q4) The fixed bar shown in fig. 1. has axial forces applied at L/3 and 2L/3. Use FEM to compute the axial deflection and support reaction? **[16]**

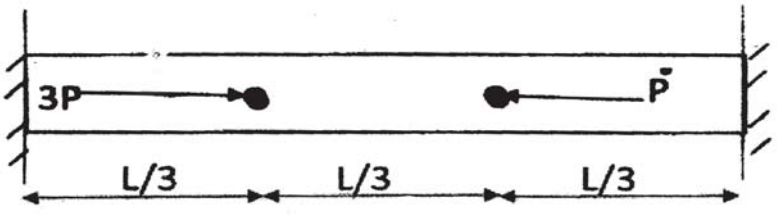

fig1.

P.T.O.

Q5) Write short note on **[16]**

a) Kirchoff theory

b) Degenerated Shell element

SECTION - II

Q6) a) Distinguish between Newton Raphon and Modified Newton Raphon Method. **[8]**

b) Explain in 2D fluid flow. **[8]**

Q7) Determine the two eigenvalues and eigenvectors corresponding to the nonzero masses, using the method of subspace iteration. **[16]**

$$[K] = \begin{vmatrix} 3 & -1 & 0 & 0 \\ -1 & 2 & -1 & 0 \\ 0 & -1 & 2 & -0 \\ 0 & 0 & -1 & 2 \end{vmatrix}$$

$$[K] = \begin{vmatrix} 2 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{vmatrix}$$

Q8) a) Explain in detail Jacobi Method. **[9]**

b) Explain in detail concept of h and p refinements. **[9]**

Q9) a) What is explicit method? Explain it in detail? **[8]**

b) Explain in detail linear buckling analysis? **[8]**

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

a) Vector iteration method

b) Adpative finite element technique.

Total No. of Questions : 8]

SEAT No. :

P2667

[Total No. of Pages :2

[4660]-217
M.E. (Mechanical) (CADM&E)
b-INTEGRATED PRODUCT DESIGN AND DEVELOPMENT
(Semester-I) (2012 Pattern) (Elective-II) (502405)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Discuss the concept of Product Life Cycle Management and its benefits. **[9]**

b) Explain the Transition of PDM into PLM. **[9]**

Q2) What is Concurrent Engineering? Explain in Detail. Elaborate the concept of House of Quality with suitable example. **[16]**

Q3) What are different types of customer needs? Discuss in detail. Elaborate any three techniques used to gather customer needs. **[16]**

Q4) a) What is technology Forecasting? Discuss any one technique. **[8]**

b) Explain FAST method with appropriate case study. **[8]**

SECTION-II

Q5) What is Product Tear Down? Discuss why to tear down the product? Explain any two methods. **[18]**

P.T.O

Q6) a) What are the objectives of Benchmarking process in new product development? Discuss. **[8]**

b) Explain 6-3-5 method in detail. **[8]**

Q7) a) Explain Laser Sintering in detail for rapid product development. **[8]**

b) Explain the concept of Design of Experiments in detail. **[8]**

Q8) a) Explain the concept of Design for manufacturing & Assembly in detail. **[8]**

b) Discuss in detail establishing engineering specifications. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P3317

[Total No. of Pages : 2

[4660] - 218
M.E. (Mechanical) (Energy Engg.)
COMPUTATIONAL FLUID DYNAMICS
(2012 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the physical significance of divergence of velocity & substantial derivative. **[8]**

b) Discuss the various flow models in CFD. Write equations in conservation and non conservation form. **[8]**

Q2) a) Consider an infinitesimally small fluid element fixed in space with usual symbolic notations derive the continuity equation in differential form. **[10]**

b) Give the classification of PDEs with suitable examples. **[6]**

Q3) a) Explain:- **[12]**

i) Types of errors.

ii) Consistency

iii) Stability

iv) Types of grids.

b) Explain how grids in cylindrical form are transformed into cartesian form. Give example. **[4]**

P.T.O.

Q4) a) Find forward difference approximation of $\left(\frac{\partial^3 f}{\partial x^3}\right)$ of the order of (Δx) for evenly grid spaced points using **[10]**

i) Taylor series formula.

ii) Forward difference formula.

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

Navier stokes equations.

SECTION - II

Q5) Explain the various solution methods for PDEs. Discuss advantages & disadvantages of each method over the other. **[16]**

Q6) a) Discuss step by step the procedure for SIMPLE Algorithm. **[10]**

b) Explain - Artificial viscosity of numerical scheme & its significance. **[6]**

Q7) a) Compare FDM & FVM used for solving CFD problems. Why FVM is preferred in CFD. **[10]**

b) Explain different boundry conditions with example of each. **[6]**

Q8) Consider a cylindrical fin with uniform cross-section area 'A'. The base is at the temperature of 100°C (T_B) and the end is insulated. The fin is exposed to an ambient temperature of 20°C. One-dimensional heat transfer in this situation is governed by

$$\frac{d}{dx}\left[KA\left(\frac{dT}{dx}\right)\right] - hp(T - T_\infty) = 0$$

Where 'h' is the convective heat transfer co-efficient. 'p' is perimeter, k-the thermal conductivity of material, T_∞ the ambient temperature. Calculate the temperature distribution along the fin using five equally placed control volumes.

Take $\frac{hp}{KA} = 25m^2$ (KA = Constant). **[18]**

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Total No. of Questions : 10]

SEAT No. :

P3318

[Total No. of Pages : 3

[4660] - 219
M.E. (Mechanical) (CADM & E)
ROBOTICS
(2012 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain in detail SCARA type of robot configuration. **[8]**

b) Explain with neat sketch what type of robot configuration is suitable for the following applications **[10]**

i) Sheet metal handling

ii) Painting

Q2) a) Explain role of homogeneous transformation matrices in robotics. **[6]**

b) The link parameters for the three link robot configuration shown in table 1. Compute the concatenated transformation matrix for each link and also find total transformation matrix for the entire configuration from initial to final link position. **[10]**

Link i	α_{i-1}	a_{i-1}	d_i	θ
1	0^o	0	0	45^o
2	90^o	5	0	0^o
3	0^o	10	0	0^o

Table 1, Q No 2 (b)

P.T.O.

Q3) a) Explain the steps for implementing D-H convention for three axis articulated robot arm. **[8]**

b) Determine the time required for each joint of a three axis RRR manipulator to travel the following distances using slew motion joint 1: 10°, joint 2: 30° and joint 3 :45°.The joint l,2and 3 are travel at a rotational velocity of 20° /s,15° /s and 30°/s respectively. **[8]**

Q4) a) What is trajectory planning and explain its role in robotics. **[8]**

b) A point P (5, 5, 5) in attached to a frame (u, v, w) in subjected to the transformations but all transformations relative to the current moving frame are as follows. **[8]**

i) A rotation of 45^{o} about u-axis.

ii) Translation of (2,-4, 1) along uvw axis.

iii) Followed by rotation of 30° about w-axis. Find the new coordinate points of a frame.

Q5) a) Compare between Bug algorithm and Tangent Bug algorithm. **[8]**

b) Explain Inverse Kinematics applied in robotics. **[8]**

SECTION - II

Q6) a) Using the L.E formulation used for describe the rigid body dynamics of the robot manipulator. **[10]**

b) Explain the joint velocities as applied to the robot arm dynamic analysis.**[8]**

Q7) a) Explain rotary position sensors used in robot joints. **[8]**

b) Explain the basic functions of robot vision system. **[8]**

Q8) a) Explain joint space scheme and Cartesian space scheme for trajectory planning. **[8]**

b) A two degree of freedom planar robot is to follow a straight line between the start (3, 10) and end (8, 14) points of the motion segment. Find the joint variables for the robot if the path is divided into 10 segments. Each link is 9 cm long. **[8]**

Q9) a) Describe the following robot language commands in brief. **[8]**

i) MOVE

ii) DELAY

iii) CLOSE

iv) OPEN

b) Show the path taken by the Cartesian co-ordinate robot. If it is directed to move across 9×9 square grid to move between the following sets of points in the grid using linear interpolation. **[8]**

i) point (1, 1) and point (6, 6)

ii) point (2, 1) and point (8, 2)

iii) point (2, 2) and point (8, 6)

Q10)a) Write short notes on artificial intelligence **[6]**

b) Future applications of robots **[5]**

c) Use of inductive and Resistive sensors in robots **[5]**

Total No. of Questions : 8]

SEAT No. :

P3400

[Total No. of Pages :2

[4660] - 220
M.E. (Mechanical) (CADM & E) (Semester - II)
MANAGEMENT OF TECHNOLOGY
(2012 Pattern)

Time : 3 Hours] *[Maximum Marks :100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Discuss Holistic Model of Management of Technology (MOT). **[8]**

b) Explain in detail the classification of Technology. **[8]**

Q2) a) What you mean by Learning Organization? Explain with suitable example. **[8]**

b) Discuss Elements and formulation of Technology Strategy. **[8]**

Q3) a) Discuss the Planning of Technology Progress. **[8]**

b) What you mean by Morphological Analysis of a Technology System? Explain. **[8]**

Q4) Write Short Notes on Any Three of the following: **[18]**

a) Significance of Technology Management

b) Technology Forecasting Approaches

c) Technology Cycle

d) S-Curve for Technology Adoption

e) Technology Performance Parameters.

P.T.O.

SECTION - II

Q5) a) Discuss the system of Technology Transfer Public and Private Enterprises. **[8]**

b) Discuss the success and failure factors in Technology Transfer. **[8]**

Q6) a) Discuss the concepts of Invention and Innovation. **[8]**

b) Discuss the National Innovation System (NIS). **[8]**

Q7) a) Explain Analytical Hierarchical Process (AHP) applied to industrial products. **[8]**

b) Discuss statutory exceptions in Intellectual Property Rights. **[8]**

Q8) Write Short Note on Any Three of the following: **[18]**

a) Challenges in commercializing research work.

b) Classification of Research and Development

c) Model of Technology Transfer

d) AHP applied to Machine Tools

e) Government Scheme for Innovation

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Total No. of Questions : 10]

SEAT No. :

P3319

[Total No. of Pages : 3

[4660] - 221

M.E. Mechanical (CADM & E) (Semester - II)

COMPUTER AIDED MANUFACTURING

(2012 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the basic elements of numerical control. **[6]**

b) Explain different types of automation used in production plant. **[6]**

c) Explain the modern maintenance and diagnostics systems used in automated systems. **[6]**

Q2) a) Explain numerical control ISO coding systems. **[8]**

b) Explain with neat block diagram the configurations of distributed numerical control. **[8]**

Q3) a) Explain different part programming formats. **[6]**

b) Write a complete NC part program for the component shown in Fig. 1, Draw the tool path and take raw material MS blank of 105 mm x 85 mm, spindle speed 300 RPM and feed 0.2 mm/rev. all dimensions are in mm. **[10]**

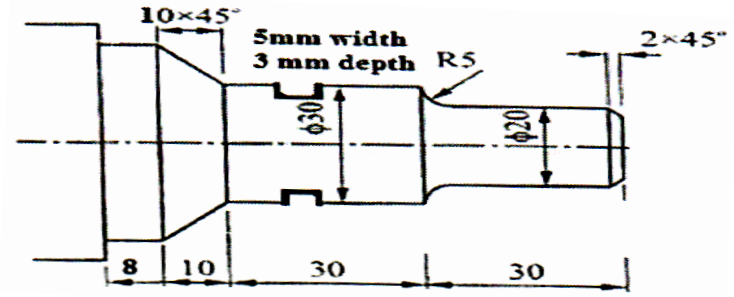

Fig.1.Q - No.3(b)

P.T.O.

Q4) a) Explain the different types of motion commands used in APT programming. **[6]**

b) Write a complete APT part program to generate end profile for the component shown in. Fig 2. Use post processor call statement MACHINE MILL, Draw the tool path and take raw material stainless steel blank of 160 mm x 100 mm, spindle speed 400 RPM and feed 0.25 mm/rev. all dimensions are in mm

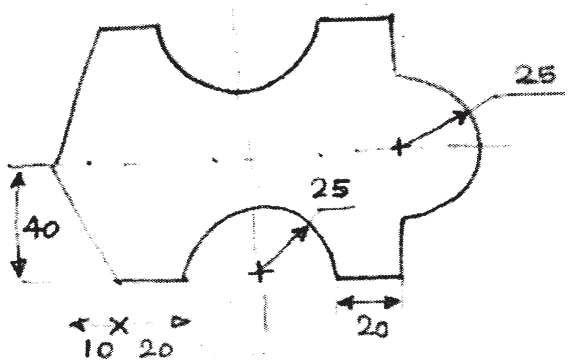

Fig.2.Q - No.4(b)

Q5) a) Explain the principle functions of DNC. **[8]**

b) Explain with neat block diagram of hard wired and soft wired configuration of a CNC. **[8]**

SECTION - II

Q6) a) Explain MI-CLASS part classification and coding systems used in group technology. **[10]**

b) Explain GT applications for manufacturing processes. **[8]**

Q7) a) Explain the components of FMS. **[10]**

b) Explain anyone FMS layout. **[6]**

Q8) a) Explain Esprit CIM – OSA model. **[8]**

b) Draw neat sketch Siemens concept of CIM applicable to manufacturing enterprise. **[8]**

Q9) a) Explain in brief types of process planning and discuss their merits over

each other. **[10]**

b) Explain the activities of production planning department. **[6]**

Q10)a) Write short notes on MRP - II. **[6]**

b) Explain with neat block diagram principle of EDM. **[5]**

c) Write short notes on CMM. **[5]**

Total No. of Questions :8]

SEAT No. :

P3270

[Total No. of Pages :2

[4660]-222
M.E. (Mechanical) (CADM/E)
COMPUTER INTEGRATED MANUFACTURING
(2012 Course) (Semester - II) (502410)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Explain various elements of CIM in detail. **[9]**

b) Elaborate the concept of Product Development and CIM. **[9]**

Q2) Discuss the transition of Engineering Data Management to Product Data Management and to Product Life cycle Management? What were demanding factors? Explain in detail concept of PLM. **[16]**

Q3) What is Flexible Manufacturing System? What are limitations of Traditional Manufacturing System? Explain in detail the elements of FMS. **[16]**

Q4) a) Explain in detail Manufacturing Cell with suitable example. **[8]**

b) Discuss various issues related to CIM Database. **[8]**

SECTION -II

Q5) What is Lean Manufacturing? Explain in detail. Elaborate the concept of KANBAN. State and explain various KANBAN rules. **[18]**

P.T.O.

Q6) a) Explain Advantages and disadvantages of Push and Pull systems in detail. **[8]**

b) What is the necessity of manufacturing forecasting? Discuss. **[8]**

Q7) a) Explain Supply Chain Management in detail. **[8]**

b) Explain the application of web based engineering for casting process. **[8]**

Q8) a) Elaborate the role of manufacturing capacity planning in productivity improvement? **[8]**

b) What is the Material Requirement Planning? Discuss. **[8]**

EEE

Total No. of Questions : 8]

SEAT No. :

P3453

[Total No. of Pages :2

[4660] - 225
M.E. (Mechanical) (CADM&E)
SIMULATION & MODELING
(2012 Pattern) (Semester - II)

Time : 3 Hours] *[Maximum Marks :100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Discuss various Application areas of Simulation. What are limitations of Simulation? **[9]**

b) Discuss in detail discrete and continuous system simulation with suitable .**[9]**

Q2) Discuss briefly Mid Square Method, Mid Product Method, Constant Multiplier Technique and Additive Congruential Method for Random Number **[16]**

Q3) Discuss in detail, Uniform Distribution, Poisson Distribution, Geometric Distribution and Gamma Distribution with suitable examples. **[16]**

Q4) a) Elaborate the concept of Single Channel queue with suitable example and analysis. **[8]**

b) Discuss the systematic procedure for simulation model building. **[8]**

P.T.O.

SECTION - II

Q5) What are the performance parameters of simulation? Discuss in detail. How randomness affects productivity? Discuss factors causing randomness. **[18]**

Q6) a) Explain Verification and Validation of Simulation Model. **[8]**

b) Discuss Chi Square Test in Detail. **[8]**

Q7) a) Discuss the concept of Machine Downtime with example. **[8]**

b) What is the applicability of Kolmogorov-Smirnov test in simulation? Discuss. **[8]**

Q8) a) Discuss output analysis for Simulation Termination. **[8]**

b) Perform run tests on following sequence. 0.09 0.07 0.023 0.55 0.86 **[8]**

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Total No. of Questions : 8]

SEAT No. :

P2668

[Total No. of Pages :2

[4660]-226
M.E. (Mechanical) (CADM&E)
OPTIMIZATION TECHNIQUES
(Elective-III) (Semester-II) (502411-D) (2012 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain Optimum design procedure of pins. **[6]**

b) A beam of uniform rectangular cross section is to be cut from a log having a circular cross section of diameter 2a. The beam has to be used as a cantilever beam (the length is fixed) to carry a concentrated load at the free end. Find the dimensions of the beam that correspond to the maximum tensile (bending) stress carrying capacity. **[10]**

Q2) a) Explain Karmarkar's method. **[6]**

b) Solve LPP by simplex method **[10]**
Minimize:

$$f = 2x_1 + 3x_2 + 2x_3 - x_4 + x_5$$

Subject to:

$$3x_1 - 3x_2 + 4x_3 + 2x_4 - x_5 = 0$$

$$x_1 + x_2 + x_3 + 3x_4 + x_5 = 2$$

Where, $x_i \geq 0 : i = 1 \text{ to } 5.$

Q3) a) Explain minimum bracketing methods like exhaustive search method. **[6]**

b) Find the minimum of f(x) = x (x-1.5) in the interval (0.0,1.0) to within 10% of the exact value by using interval halving method. **[10]**

P.T.O

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

a) Formulation of optimization problem.

b) Successive quadratic estimation.

c) Sensitivity or post- optimality analysis.

d) Cubic search method.

SECTION-II

Q5) Minimize $F(x_1, x_2) = x_1 - x_2 + 2x^2_1 + 2x_1x_2 + x^2_2$ with initial solution of using $\begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ Cauchy's steepest descent method up to three iterations. **[16]**

Q6) Solve the constrained Himmelblau's function in the variable range of $0 \le x_1, x_2 \le 5$ using Complex search method for initial four feasible points. Find worst point. **[16]**

$$F(x_1, x_2) = (x^2_1 + x_2 - 11)^2 + (x_1 + x^2_2 - 7)^2$$

$$g_1(x) = 26 - (x_1 - 5)^2 - x^2_2 \ge 0$$

$$g_2(x) = 20 - 4x_1 - x^2 \ge 0.$$

Q7) a) Discuss the algorithm for method of multipliers. **[8]**

b) Explain the working principle of Genetic Algorithm in detail. **[8]**

Q8) Attempt any three of the following: **[18]**

a) Test Functions**.**

b) Cutting plane Method.

c) Variable Metric Method.

d) Geometric programming.

□□□□

Total No. of Questions : 8]

SEAT No. :

P3271

[Total No. of Pages : 2

[4660] - 227
M.E. (Mechanical) (CADM &E)
a- PRODUCT LIFECYCLE MANAGEMENT
(2012 Pattern) (Elective -IV) (502412)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain Product Data and Product Work Flow in PLM. **[9]**

b) Explain 2-tier and 3-tier PLM System Architecture. **[9]**

Q2) What is PLM Strategy? Explain the concept with its importance. Discuss any four characteristics of PLM. **[16]**

Q3) Discuss in detail various threads of PLM. **[16]**

Q4) a) Elaborate the concept of Collaborative Product Development. **[8]**

b) Discuss various key management issues related to Product Data Management. **[8]**

SECTION - II

Q5) What are Change Management and Configuration Management? How they are related? Discuss in detail with importance. **[18]**

P.T.O.

Q6) a) What is Object Based Database? Discuss in detail. **[8]**

b) Describe Document and Hardware Management in PDM. **[8]**

Q7) a) Describe in brief the role of Human Resources in PLM. **[8]**

b) Discuss Entity-Relationship Model. **[8]**

Q8) Discuss various phases of Product Life Cycle and Corresponding technologies applied in detail. **[16]**

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Total No. of Questions : 8]

SEAT No. :

P3485

[Total No. of Pages : 2

[4660]-228

M.E. (Mechanical) (Computer Aided Design, Manufacturing & Engineering)

RAPID PROTOTYPING

(2012 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) What is RP technology? Where it is used? Classify RP processes and explain RP process chain with its feature. **[16]**

Q2) What is SL process? Explain the following: **[16]**

a) SL Apparatus and Process

b) Layering technology and its applications

Q3) List solid based RP systems with its working principle. Explain LOM process. **[16]**

Q4) Explain in brief: **[18]**

a) 3DP including model specification, Process Characteristic

b) Conventional tooling and RT

P.T.O.

SECTION - II

Q5) How solids are represented? Brief this representation with two methods and its features. Which techniques are used in present software's? **[16]**

Q6) Brief concepts of : **[16]**

a) Algorithm for Shading and Rendering

b) Feature recognition and Tolerance representation

Q7) Explain in brief : **[16]**

a) 3D printing process, working principle with case study

b) Direct rapid tooling, direct AIM and LOM tools

Q8) Explain the following: **[18]**

a) CAD Database structure

b) Behavioural modeling

c) Product data management

Total No. of Questions : 12]

SEAT No. :

P2669

[Total No. of Pages :2

[4660]-232
M.E. (Electrical) (Control System)
ADVANCED MATHEMATICAL TECHNIQUE FOR CONTROL SYSTEM
(2008 Pattern) (Semester-I) (503101)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain the method of Lagrangian Multiplier. **[8]**

b) Write the concept of local and global extrema. **[8]**

OR

Q2) a) Use analytical method to investigate for extremum point $4x^3 - 18x^2 + 27x - 7$ **[9]**

b) Explain the concept of Convex function. **[7]**

Q3) a) Explain the method of multivariable optimization with inequality constraints. **[8]**

b) Explain the multivariable optimization with no constraints. **[8]**

OR

Q4) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the point $x_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ **[16]**

P.T.O.

Q5) a) Write standard form of linear programming problem. **[9]**

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

OR

Q6) Maximize: $F=x_1+2x_2+x_3$

Subject to:

$$2x_1+x_2-x_3\le 2$$
$$-2x_1+x_2-5x_3\ge -6$$
$$4x_1+x_2+x_3\le 6$$
$$x_i\ge 0, i=1,2,3$$

[18]

SECTION-II

Q7) a) Explain the Dichotomous Search Method. **[9]**

b) Explain what do you understand by unimodal function. **[9]**

OR

Q8) Minimize $f(x)=0.65-[0.75/(1+x^2)]-0.65x\tan^{-1}(1/x)$ in the interval [0,3] by the Fibonacci method using n=6. **[18]**

Q9) Explain the method of finding unconstrained geometric programming problem from differential calculus point of view. Discuss the degree of difficulty and sufficiency condition. **[16]**

OR

Q10) What is multistage decision process also explain the concept of suboptimization. **[16]**

Q11) Explain the basic concept of stochastic linear and nonlinear programming. **[16]**

OR

Q12) Explain what do you understand by dynamic programming. **[16]**

□□□□

Total No. of Questions :12]

SEAT No. :

P2671

[Total No. of Pages :3

[4660]-234
M.E. (Electrical) (Control System)
NONLINEAR CONTROL SYSTEM
(2008 Course) (Semester - I) (503103)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Discuss various nonlinearities present in the system. Give example of each type of nonlinearity. **[8]**

b) Explain the following terms in connection with nonlinear control system. **[9]**

i) Jump resonance.

ii) Hard and soft excitaion.

iii) Limit cycle.

OR

Q2) a) Explain different singular points for autonomous system. **[9]**

b) Draw phase plane trajectory portrait Vandor pol equation. **[8]**

Q3) a) Consider the system described by $\ddot{x} + 2\dot{x} + x = 0$. Evaluate phase plane trajectory with $x_1(0) = 0$ $x_2(0) = 0.5$. **[9]**

b) Explain Delta method for phase plane analysis. **[8]**

OR

P.T.O.

Q4) A unity feedback control system having $G(s) = \frac{1}{s(s+1)}$ is driven by relay having dead zone $d = \pm 1$ and output amplitude equal to $\pm$ 1. Construct phase plane trajectory in (e, i) plane for one complete cycle. Also find limit cycle if any. **[17]**

Q5) a) Derive describing function for saturation nonlinearity. **[8]**

b) Explain stability of nonlinear control system with describing function method. **[8]**

OR

Q6) System having $G(s) = \frac{1}{s(s+1)}$ in cascaded with ON - OFF relay having dead zone $d = \pm 1$ and output amplitude = $\pm$ 1. Determine stability of control system with describing function method. **[16]**

SECTION -II

Q7) a) Explain **[8]**

i) Positive definite and semidefinite.

ii) Negative definite and semidefinite. Give also examples for each catagory.

b) Apply Lyapunov direct method to determine stability of the system given below:

$$A = \begin{bmatrix} -1 & -2 \\ 0 & -1 \end{bmatrix}$$ **[8]**

OR

Q8) a) Express scalar function given below in Quadratic form and test it for definiteness $V(x) = 2x_1^2 + x_2^2 + 2x_3^2 + x_1x_2 - x_1x_3 + 2x_2x_3$. **[8]**

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

Q9) a) For Linear time invariant system $\dot{x} = Ax$. Derive expression $A^TP + PA = -Q$ where P and Q are real symmetric and positive definite matrices. **[9]**

b) Explain the terms in the sense of Lyapunov **[8]**

i) Stability

ii) Asymptotic stability

iii) Asymptotic stability in large

iv) Instability

OR

Q10)a) Explain Krasovskii method for determination of Lyapunov function.**[9]**

b) Compare isocline method, describing function method and Lyapunov function for analysis of nonlinear control system. **[8]**

Q11)Write short notes on: **[17]**

a) Sliding mode control

b) Input output linearization

c) Input state linearization

OR

Q12)Explain clearly for input - output linearization and input state linearization for system given as below.

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

$$\dot{x}_2 = -2u$$ **[17]**

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Total No. of Questions :12]

SEAT No. :

P2672

[Total No. of Pages :2

[4660]-235
M.E. (Control System)
a - AUTOMATION & ROBOTICS
(2008 Pattern) (Elective - I) (Semester - I) (503104)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Give Definition of Robotic/s given by various organization including ISO. **[9]**

b) What is work envelope of a Robot? Explain with neat diagram. **[9]**

OR

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

b) Explain in detail following terms - degree of freedom, yaw, pitch and roll. **[9]**

Q3) a) Explain Robot classification according to form of motion. **[8]**

b) Write various End Effectors used in design of Robot. **[8]**

OR

Q4) a) Explain various types of links. Draw sketches. **[8]**

b) Explain online programming and offline programming in robot. **[8]**

Q5) a) Explain SCARA robot with neat sketches. **[8]**

b) What are the various actuators required in robot applications. And what are their selection criteria. **[8]**

OR

P.T.O.

Q6) a) Explain teach pendent and its importance in robot programming. **[8]**

b) Explain programming language in robot. **[8]**

SECTION -II

Q7) a) The coordinates of the point 'P' on the body are given by $\{1, 2, -3\}^T$. The point is rotated about z axis by 30^o and then about by 60^o and then by 90^o. Find the final coordinates of the point 'P' w.r.t. the fixed frame. **[10]**

b) Explain homogeneous transformation matrix and its use in transformation. **[8]**

OR

Q8) a) Explain KE and PE equations and derive Newton Euler Equation using. **[9]**

b) Explain single prismatic joint working against gravity and single revolute joint using Lagrangian technique. **[9]**

Q9) a) Give one example of forward solution for PUMA robot. **[8]**

b) Explain Geometric approach with co-ordinate transformation. **[8]**

OR

Q10)a) Explain DH criteria in detail. **[8]**

b) Write Rules for establishing link co-ordinate frames. **[8]**

Q11) a) Explain PID control system used in robot manipulator. **[8]**

b) Explain Resolved Motion Rate control used in robot system. **[8]**

OR

Q12)a) Explain Jacobian for prismatic joint control which is used in Cartesian type of robot. **[8]**

b) Explain Joint Position Control used in robot system. **[8]**

EEE

Total No. of Questions: 6]

SEAT No. :

P3320

[Total No. of Pages : 2

[4660] - 236
M.E. (Electrical) (Control System)
MODELING OF DYNAMIC SYSTEMS
(2008 Pattern) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain magnetic Leviation system for an experimental rail vehicle considering it as distributed parameter model. **[9]**

b) Obtain the distributed parameter model in case of heat translation by conduction in an insulated bar. **[8]**

c) Discuss in detail the Lumped Parameter Approximations for vibrations of a rod. **[8]**

Q2) a) Explain in detail anyone multiple regression and Least square method for modeling. **[8]**

b) Discuss the following generalized modeling methods. **[10]**

i) Random signal testing method

ii) Parameter Tracking method

c) Explain with suitable example the method of sub system coupling.**[7]**

P.T.O.

Q3) a) State and explain the merits and limitations of analog simulation, methods. **[5]**

b) Enumerate the various digital simulation techniques. Explain any one specific digital simulation technique for finding generalized response.**[10]**

c) Define convolution Integral. Explain the procedure for obtaining response to arbitary inputs with known impulse response. **[10]**

SECTION - II

Q4) a) Explain clearly any one static thermal system. How to carry out the circuit analysis of such a system. **[8]**

b) Explain the following concepts. **[10]**

i) Thermal capacitance

ii) Thermal resistance.

c) Discuss the effect of following properties of fluids on the dynamics of the fluid system: **[7]**

i) Viscosity

ii) Temperature and

iii) Density.

Q5) a) Explain with suitable example the analogy between the mechanical system and corresponding analogous electrical system. **[8]**

b) State the D'Alembert's principle and explain with suitable example, its application in system modeling and analysis. **[9]**

c) Explain the standard inputs used for system analysis. Discuss the important steps in system simulation. **[8]**

Q6) a) Explain the various techniques used for system modelling. **[9]**

b) Explain with a suitable example, any dynamic system and clearly define the terms associated with dynamic system. **[10]**

c) Explain in detail the classification of models of dynamic system. **[6]**

Total No. of Questions : 6]

SEAT No. :

P3321

[Total No. of Pages : 2

[4660] - 237

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

ADVANCED TOPICS IN CONTROL SYSTEMS

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each Section.***
2) ***Answer to the two Sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume Suitable data, if necessary.***

SECTION - I

Q1) a) Define and explain Generalization of neural network. **[5]**

b) Sketch multiple input neuron model and derive its Activation function. **[8]**

c) Draw recurrent network and explain supervised, unsupervised, rain forced and hebbian learning. **[12]**

Q2) Explain with neat diagram the following :

a) Fast output sampling Feedback. **[8]**

b) Periodic output Feedback, and **[8]**

c) Multirate output control. **[9]**

Q3) a) Explain with neat diagram the deterministic model of artificial neuron. Also explain with mathematical formula and graphical representation, the activation functions. **[10]**

b) What is Neural Network? Explain how the artificial neural network is inspired from biological neuron. Give atleast four reasons to use neural network. **[10]**

c) State the typical applications of Artificial Neural Networks. **[5]**

P.T.O.

SECTION - II

Q4) a) Draw a block diagram of a typical adaptive system and explain the working of each block, Also explain precisely the term 'Adaptive Controller.' **[10]**

b) What is 'Model Reference Adaptive Control'? Explain the different methods generally being used in connection with MRAC. **[8]**

c) Explain with neat diagrams the various adaptive control schemes. **[7]**

Q5) a) Enumerate the uncertainties in System Matrix and Input Matrix. **[8]**

b) Explain clearly the concept of variable structure control. **[5]**

c) Explain with suitable example, the terms 'Sliding Surface' and 'Dynamic Sliding Surface' **[12]**

Q6) a) What are the necessary conditions for arbitrary pole - placement? Explain with block diagram the pole-placement design method using Linear State Variable Feedback. **[10]**

b) A linear time-in variant control system is represented in state space form:

$$x^a(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -24 & 4 & 1 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$

Design a linear state variable feedback to place the poles at desired locations : S = –3 and $(-2 \pm j2)$. **[15]**

Total No. of Questions : 12]

SEAT No. :

P3322

[Total No. of Pages :4

[4660] - 238

M.E. (Electrical) (Control System)

COMPUTER AIDED CONTROL SYSTEM DESIGN

(Elective - II) (2008 Pattern)

Time : 3 Hours] *[Maximum Marks :100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Define and explain the concepts of stability, controlability and observability of a linear control system. **[6]**

b) Explain the procedure of determing the controllability and observability of the control system using computer method. Give its flow chart and write the algorithm. **[12]**

OR

Q2) a) Explain the computer method for obtaining the solution of state and output equation of a control system represented by:

$$\dot{x}(t) = Ax(t) + Bu(t)$$

$$y(t) = Cx(t)$$

With usual notation. Give its algorithm or flow chart. **[6]**

b) Explain with suitable example the relation between controllability, observability and pole-zero cancellation. **[6]**

c) Outline the procedure for determing the stability of a control system represented in state-space form using computer method. Give its algorithm **[6]**

P.T.O.

Q3) a) Explain the method of pole-placement design using linear state variable feedback. Draw the neat block diagram showing LSVF. **[6]**

b) A linear time-invariant control system is represented in state-space form

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

Design the linear state variable feedback to place the poles at desired locations: $S=-2,-3 \text{and} -5$ **[10]**

OR

Q4) a) What is an observer? State the merits and demerits of an observer system.**[6]**

b) Draw the appropriate block diagram showing the structure of a full order observer system and explain the procedure for designing a full order observer system. In this connection, state the principle of separation.**[10]**

Q5) a) Explain with neat diagram the working of **[6]**

i) Proportional controller

ii) Proportional-Integral controller and

iii) Proportional-Integral-Derivative controller

b) Outline the design procedure of tunable PID controller using Ziegler-Nichols method. State the advantages of this method. **[10]**

OR

Q6) a) Draw the functional block diagram of a basic digital control system and explain the function of each block **[6]**

b) What are the factors to be considered for the selection of sampling period? **[2]**

c) A discrete-time control system is represented by the difference equation:

$$x(k+1) = F\ x(k) + G\ u(k)$$

Where 'k' is the sampling instant; F and G are constant matrices; x(k) is n×1 state vector; u (k) is m×1 control vector. Explain with algorithm the procedure for computer method of obtaining the system response. Give its algorithm. **[8]**

SECTION - II

Q7) a) Define relative stability. State and explain the measures of relative stability using polar plot or Bode diagram **[6]**

b) Derive the transfer function and draw the corresponding Bode diagram of the following compensating networks; **[10]**

i) Phase - lead network

ii) Phase - lag network

OR

Q8) a) Compare cascade compensation with feedback compensation. Explain with diagram the tachometer feedback compensation. **[6]**

b) A certain unity feedback control system has open - loop transfer function

$$G(S) = \frac{K}{s(1+0.2s)(1+0.5s)}$$

Design a suitable compensator to satisfy the following design specifications:

i) Velocity error constant $\geq 12\,\text{sec}^{-1}$

ii) Phase margin $\phi_m \geq 50°$

Draw the Bode diagrams for uncompensated and compensated system. **[10]**

Q9) a) Explain the computer method for obtaining the root-locus plot of a linear closed-loop control system. Give its flow chart and write its algorithm. **[12]**

b) Explain how to reshape this root-locus plot to obtain the desired performance. **[4]**

OR

Q10)a) Outline the computer method for obtaining the transient response of a linear closed-loop control system represented by the transfer function $\frac{C(S)}{R(S)}$. Give its algorithm and draw the flow chart. **[12]**

b) How to obtain the optimum parameters of the system for desired performance? **[4]**

Q11)a) Define the singular point and discuss the different singular points in phase-plane technique. **[6]**

b) Explain with algorithm the computer method for obtaining the phase plane trajectory for a non-linear control system with 'Dead-Zone' as non-linearity. Draw its flow chart. **[12]**

OR

Q12)a) State the merits and demerits of describing function method for the design and analysis of nonlinear control system **[6]**

b) Explain with algorithm the computer method for simulating the non-linear control system containing 'Saturation' nonlinearity using describing function method. Comment on the stability determination using this method. **[12]**

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Total No. of Questions :12]

SEAT No. :

P2673

[Total No. of Pages :2

[4660]-239

M.E. (Electrical) (Control Systems)

c - SCADA SYSTEMS & APPLICATIONS

(2008 Pattern) (Elective - II) (Semester - I) (503105)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Draw & explain Interfacing block diagram of PLC with SCADA & each block in detail. **[10]**

b) Which are the communication technologies used in SCADA? Explain. **[8]**

OR

Q2) a) State Monitoring & Supervisory control functions of SCADA. Explain any four functions in detail. **[10]**

b) Explain Ladder diagram programming with suitable example. **[8]**

Q3) Draw & Explain in detail block diagram of SCADA system. **[16]**

OR

Q4) Draw & Explain block diagram of RTU. Also explain its functions. **[16]**

Q5) State & Explain different SCADA Architectures in detail. **[16]**

OR

Q6) Explain in detail IEC 61850 SCADA / HMI system. **[16]**

P.T.O.

SECTION -II

Q7) Compare & also explain different wired & wireless communication technologies used in SCADA. **[16]**

OR

Q8) Which are the various communication protocols used in SCADA? Give its main features & compare. **[16]**

Q9) Explain use of SCADA in state estimation also explain different operating states. **[16]**

OR

Q10) Explain SCADA configuration for Automatic substation control. **[16]**

Q11) Explain functions of SCADA w.r.t. Generation, transmission & Distribution sector. **[18]**

OR

Q12) Explain the need of SCADA in Oil / Gas / Water Industry. Give any one case study. **[18]**

EEE

Total No. of Questions :12]

SEAT No. :

P2674

[Total No. of Pages :3

[4660]-240

M.E. (Electrical)(Control System)

MULTIVARIABLE AND OPTIMAL CONTROL SYSTEM

(2008 Course) (Semester - II) (503108)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Write merits and demerits of representation of multivariable control system of **[8]**

i) State space representation

ii) Transfer matrix representation

b) Differential equations of multivariable control system are given by

$$2\frac{d^2y_1}{dt^2} + 2\frac{dy_2}{dt} + y_1 = u_1$$

$$\frac{d^2y_2}{dt^2} + 2\frac{dy_1}{dt} + 2y_2 = 2u_2$$ **[10]**

OR

Q2) a) State space representation of multivariable system is given by **[12]**

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

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

P.T.O.

Find

i) Transfer matrix of the system.

ii) Characteristic polynomial of the system.

b) Explain output solution of system defined by $\dot{X} = Ax + Bu$ in time domain. **[6]**

Q3) Explain full state controllability. also determine controllability of multivariable control system represented by the state space form with **[16]**

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

OR

Q4) Explain full state observability. Also determine observability of multivariable control system represented in Q.3 **[16]**

Q5) Explain design aspect with neat block diagram of multivariable control system **[16]**

i) De coupling control

ii) Model matching control

OR

Q6) Explain with neat block diagram necessity of observer & state estimation problem using observer. **[16]**

SECTION -II

Q7) a) Obtain typical performance index for: **[9]**

i) Minimum time problem

ii) Minimum energy problem

iii) Minimum fuel problem

b) Discuss various factors on which design of the optimum controller depends. **[9]**

OR

Q8) a) Explain infinite time state regulator problem to obtain optimal control law. **[9]**

b) Explain various performance indices such as:

i) Integral square error

ii) Integral time absolute error

iii) Integral of absolute magnitude of error

iv) Integral time square error

Also Define performance index in control system. **[9]**

Q9) Derive the expression for the solution of Matrix - Riccati equation for finite time bound. **[16]**

OR

Q10)Explain Bang-bang control for solving optimal control problem. **[16]**

Q11) Explain Pontryagin's minimum / maximum principles for solving optimal control problem. **[16]**

OR

Q12)Explain optimization by dynamic programming based on: **[16]**

a) The optimality principle

b) The imbeddiny principle

EEE

Total No. of Questions : 12]

SEAT No. :

P3272

[Total No. of Pages : 4

[4660] -241

M.E. (Electrical) (Control Systems)

SYSTEM IDENTIFICATION & ADAPTIVE CONTROL

(2008 Pattern) (Semester -II)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the Parametric and Non-parametric methods of system identification. **[8]**

b) An ARX model is given by $y(t) + a\, y(t-1) = b\, u\,(t-1) + e\,(t),$ Where $e(t)$ is the white noise. Data collected from this ARX model is given: **[8]**

Sample t	1	2	3	4	5
Input $u(t)$	1	0	1	1	0
Output $y(t)$	0	1	-0.5	1.25	0.375

Estimate the parameter vector $\hat{\theta} = \left(\phi^{T}\phi\right)^{-1}\phi^{T} y$ from the available data using the least square estimation method.

OR

Q2) a) Classify the different technique of system identification. **[8]**

P.T.O.

b) Consider the estimate $\hat{\theta} = \left(\phi^{T}\phi\right)^{-1}\phi^{T}y$ .Assuming that the data satisfy

$y(t) = \phi^{T}(t)\,\theta_{0} + e(t)$

where $e(t)$ is a white noise with zero mean and variance λ^{2},

Prove that the covariance matrix of $\hat{\theta}$ is given by

$\text{cov}\left(\hat{\theta}\right) = \lambda^{2}\left(\phi^{T}\phi\right)^{-1}$. **[8]**

Q3) a) State different types of inputs used in identification process and explain PRBS input in details. **[8]**

b) Justify whether PRBS input is persistantly exciting signal? **[8]**

OR

Q4) a) Define System identification. Explain the procedure of identification with neat flow-chart. **[8]**

b) Explain how an appropriate model structure is chosen for estimation of the parameters. Draw the relationship between loss function and the model structure. **[8]**

Q5) Write detailed notes on any two of the followings:

a) Various learning methods. **[9]**

b) Parametric and Non-parametric training methods. **[9]**

c) Image processing. **[9]**

OR

Q6) Write detailed notes on any two of the followings:

a) Pattern Recognition. **[9]**

b) Bayesian Learning. **[9]**

c) Recursive Estimation Method. **[9]**

SECTION - II

Q7) a) Prove that Matrix Inversion Lemma: **[8]**

$$[A + B C D]^{-1} = A^{-1} - A^{-1} B \left[C^{-1} + D A^{-1} B\right]^{-1} D A^{-1}$$

b) Discuss, in details, the "Ship Steering Dynamics". **[8]**

OR

Q8) a) Explain the working principle of gain scheduling adaptive control scheme with neat diagrams. Give two applications of gain scheduling adaptive control scheme. **[8]**

b) State the various ideas used for designing the gain scheduling controller. Explain any one of them. **[8]**

Q9) a) Explain the PID Controller and discuss the closed loop method of tuning of PID Controller. **[8]**

b) An ideal relay, with saturation levels +/-1 unit, is connected in series with a linear transfer function $G(s) = \dfrac{10}{s(s+1)(s+10)}$, in a unity feedback control system. Calculate the ultimate gain K_u and the ultimate period T_u, using the method of Describing Function. **[8]**

OR

Q10) Write detailed notes on any two of the followings:

a) Self Tuning Regulator (STR). **[8]**

b) Diophantine equation. **[8]**

c) Applications of Adaptive Controls. **[8]**

Q11) a) Explain, with neat diagrams, the Model Reference Adaptive Scheme (MRAS). **[4]**

b) The process transfer function is given by, $\frac{Y(s)}{U(s)} = \frac{b}{s+a}$, where *a* and *b* are unknown parameters, U is the process input and Y is the measured output. It is desired to obtain a closed loop transfer function, $\frac{Y_m(s)}{U_c(s)} = \frac{b_m}{s+a_m}$, where U_c is the controlled input and Y_m is the desired model output. The controller is given by $U(t) = \theta_1 U_c(t) - \theta_2 Y(t)$. Draw a MRAS based on the Lyapunov technique. Assume the Lyapunov function:

$$V(e, \theta_1, \theta_2) = \frac{1}{2}\left(e^2 \frac{1}{b\gamma}(b\theta_2 + a - a_m)^2 + \frac{1}{b\gamma}(b\theta_1 - b_m)^2 \right). \quad \textbf{[10]}$$

c) Draw a simulation diagram of the MRAS in (b) above. **[4]**

OR

Q12) a) State and explain the MIT Rule. **[4]**

b) The process transfer function is given by, $\frac{Y(s)}{U(s)} = \frac{b}{s+a}$, where *a* and *b* are unknown parameters, U is the process input and Y is the measured output. It is desired to obtain a closed loop transfer function, $\frac{Y_m(s)}{U_c(s)} = \frac{b_m}{s+a_m}$, where U_c is the controlled input and Y_m is the desired model output. The controller is given by $U(t) = \theta_1 U_c(t) - \theta_2 Y(t)$. Draw a MRAS based on the MIT Rule. Explain the aproximations made and comment on any prior knowledge about the plant that may be required. **[10]**

c) Draw a simulation diagram of the MRAS in (b) above. **[4]**

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Total No. of Questions :12]

SEAT No. :

P2675

[Total No. of Pages :2

[4660]-242
M.E. (Electrical Control System)
ADVANCED DIGITAL CONTROL TECHNIQUE
(2008 Pattern) (Semester - II) (503110)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) What is sample and hold principle? Write a short note on Zero Order Hold. **[8]**

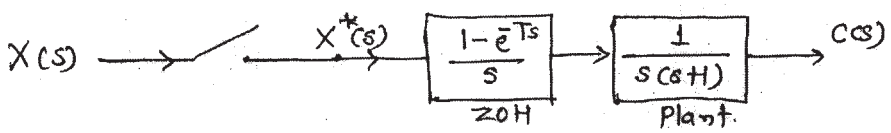
b) Explain numerical integration method for digital modeling. **[8]**

OR

Q2) a) What is partial matching of states? Elaborate with equations. **[8]**

b) Write a short note on digital re-design. **[8]**

Q3) a) Obtain the pulse transfer function of following system for T=1 sec. **[9]**



b) Enlist different steps required to design a digital phase lead compensator using root locus technique. **[9]**

OR

Q4) For the following G(z), draw the block diagram for: **[18]**

a) Direct digital programming

b) Cascade digital programming

c) Parallel digital programming $G(z) = \frac{10(1+0.5z^{-1})}{(1-z^{-1})(1-0.5\,z^{-1})}$

P.T.O.

Q5) a) Explain full order state observer. **[8]**

b) Explain Ackermann formula for determination of feedback gain matrix K_e. **[8]**

OR

Q6) a) Explain deadbeat control by state feedback and deadbeat observer. **[8]**

b) Write a short note on state regulator design. **[8]**

SECTION -II

Q7) a) Explain finite word length effect in digital filters. **[10]**

b) Draw and explain direct form structure of FIR filter. **[8]**

OR

Q8) a) What are different methods of design of FIR filter? Explain any one in brief. **[10]**

b) Write a short note on fixed and floating point DSP. **[8]**

Q9) Draw and explain in detail architecture of TMS320C5X processor. **[16]**

OR

Q10)a) Explain instruction pipe line in DSP. **[8]**

b) State any four key features of TMS320C54X DSP. **[8]**

Q11)a) Explain discrete wavelet transform in detail. **[8]**

b) Explain the internal memory organization of TMS320C54X DSP. **[8]**

OR

Q12)a) Explain sampling rate conversion in DSP. **[8]**

b) Explain direct addressing of TMS320C54X processor. **[8]**

EEE

Total No. of Questions : 6]

SEAT No. :

P3323

[Total No. of Pages : 3

[4660]-243

M.E. (Electrical) (Control System)

ROBUST CONTROL SYSTEMS

(2008 Pattern) (Elective - III)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Prove that the Riccati equation;

$$A^TP + PA - PBB^TP + C^TC = 0$$

has unique positive semidefinite stabilizable solution assuming the pair (A,B) stabilizable and the pair (C,A) detectable. **[10]**

b) State and explain Algebraic Riccati Equation associated with the Hamiltonian matrix H. **[5]**

c) Find out the eigenvalues and eigenvectors for the matrix

$$M = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 4 & 2 \\ 4 & 3 & 1 \end{bmatrix}$$

[10]

P.T.O.

Q2) a) State and prove Small Gain Theorem for Internal Stability. **[10]**

b) Evaluate the internal stability for the system:

$$P = \begin{bmatrix} \dfrac{1}{s+1} & 0 \\ 0 & \dfrac{1}{s-1} \end{bmatrix} \text{ and } K = \begin{bmatrix} (1-s) & -1 \\ 0 & -1 \end{bmatrix}$$ **[15]**

Q3) a) Explain briefly the following : **[10]**

i) Robust performance.

ii) Model Uncertainty.

b) State and explain the conditions for output feedback stabilizability in context with Luenberger Observer. **[7]**

c) Explain Linear Fractional Transformation. State the condition for well defined LFT. **[8]**

SECTION - II

Q4) a) Outline the procedure for computing RL∞ norm. **[7]**

b) Define H_2 and H_∞ spaced and state the norms induced on them. **[8]**

c) Obtain the H_2–norm and H_∞ -norm for the following system :

$$G(s) = \left[\begin{array}{cc:c} -1 & 1 & 2 \\ -2 & 0 & 3 \\ \hdashline 1 & 0 & 0 \end{array}\right]$$ **[10]**

Q5) a) State the assumptions made for the realization of the transfer matrix G(s) given by :

$$G(s)=\left[\begin{array}{c|cc} A_1 & B_1 & B_2 \\ \hline C_1 & 0 & D_{12} \\ C_2 & D_{21} & 0 \end{array}\right] \qquad \textbf{[10]}$$

b) Define and explain Bode's Gain and Phase relation. **[5]**

c) If $||A|| < 1$, Show that, $[I-A]^{-1} = 1+A+A^2+.....$ **[10]**

Q6) a) Define and explain the concepts of controllability observability and stability of Linear time - invariant system. **[9]**

b) Discuss feedback structure mentioning the necessity of the same. **[8]**

c) Explain mapping of continuous - time to Discrete-time system using Bilinear Transformation. **[8]**

Total No. of Questions : 6]

SEAT No. :

P3324

[Total No. of Pages : 3

[4660]-244
M.E. (Electrical) (Control System)
STOCHASTIC DYNAMICAL SYSTEMS
(2008 Pattern) (Elective - III)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) With the reference to stochastic dynamical control system, explain the following: **[10]**

i) Distributed parameter systems,

ii) Non-linear Filtering.

b) Explain step by step the procedure to find the time response of a linear discrete-time stochastic system:

$x(k+1)=F(k)x(k)+G(k)\omega(k)$

to a zero-mean white noise as input. Where x(k) is n×1 state vector; F(k) is n×n characteristic matrix; G(k) is n×p control distribution matrix and

$\{\omega(k); k = -1,0,1,2.....\}$ is p×1 discrete zero-mean white noise vector (stochastic process) **[15]**

Q2) a) Discuss the merits and demerits of Dynamic programming in linear stochastic control problem. **[5]**

b) State and explain the stochastic optimal linear regulator problem. **[5]**

c) State the separation principle and explain how it can be applied for the combined design of optimal state estimation and controller in stochastic control system. Draw the appropriate block diagram. **[15]**

P.T.O.

Q3) a) What is kalman filter? State and explain the continuous-time kalman filter algorithm. **[10]**

b) Find the time-invariant optimal kalman filter for the stochastic system:

$\dot{x}(t) = x(t) + \omega(t)$

$y(t) = x(t) + \upsilon(t)$

Assume $Q = 4\alpha$; $R=\alpha$; α = constant.

Where $\omega(t)$ and $\upsilon(t)$ are state excitation noise and observation noise respectively. Both $\omega(t)$ and $\upsilon(t)$ are zero-mean white noise processes with intensities Q and R respectively. Show that the answer is independent of α. **[15]**

SECTION - II

Q4) a) Explain the method of development for the stochastic Transitional Probability matrix for a system. **[7]**

b) Define and explain the **[8]**

i) Hilbert space and

ii) Spaces of Square and integral variables.

c) Discuss the Geometrical structures of linear estimation in stochastic dynamical system. **[10]**

Q5) a) With reference to stochastic system, explain clearly Brownian motion and white noise. **[10]**

b) Explain with suitable example the orthogonal increments process. **[5]**

c) State and explain the general properties of orthogonal increments process. **[10]**

Q6) a) How to characterize a stochastic process? Define and explain the terms: **[10]**

i) Variance matrix

ii) Covariance matrix and

iii) White noise process.

b) Out line the procedure to find the time response of a linear continuous-time stochastic system:

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

to a zero-mean white noise as input. Where x(t) is a n×1 state vector; A(t) is n×n characteristic matrix; B(t) is n×p control distribution matrix and ω(t) is p×1 mean white noise (vector stochastic process). **[15]**

Total No. of Questions : 6]

SEAT No. :

P3454

[Total No. of Pages :2

[4660] - 245
M.E. Electrical Control System
LARGE SCALE SYSTEMS
(2008 Pattern) (Elective - III)

Time : 3 Hours] *[Maximum Marks :100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are large scale systems? Explain hierarchial structure and decentralized control. **[12]**

b) Write the algorithm for obtaining reduced order model using Chidambara technique. **[13]**

Q2) Define the concept of aggregation of control systems with aggregated system matrix and state its properties. **[25]**

Q3) Find the reduced order model of the given system by model aggregation. **[25]**

$$\dot{X} = \begin{bmatrix} 0.5 & 0.5 & 0 \\ 0 & 1 & 0 \\ 0.833 & -2.116 & -0.33 \end{bmatrix} X + \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix} U$$

P.T.O.

SECTION - II

Q4) Explain the techniques of singular value decomposition along with its properties. **[25]**

Q5) What are three Cauer forms for model reduction. Elaborate in detail. **[25]**

Q6) Consider the system

$$G(s) = \frac{9 + 23.25s + 30.2s^2 + 22.25s^3 + 9s^4 + s^5}{15 + 69.5s + 119s^2 + 100s^3 + 45s^5 + s^6}$$

Find the reduced order model using Pade approximation. **[25]**

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Total No. of Questions :6]

SEAT No. :

P2676

[Total No. of Pages :2

[4660]-246

M.E. (Electrical) (Control System)

a - INTELLIGENT CONTROL

(2008 Pattern) (Elective - IV) (Semester - II) (503112)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Explain Biological inspiration for development of ANN. **[8]**

b) Explain Hebbian Architecture for Neural learning. **[8]**

c) Explain various transfer functions used in MATLAB based neural network. **[9]**

Q2) a) Explain Perceptron Learning rule with any example. **[8]**

b) Explain MLP learning method. **[8]**

c) Explain BAM theory in detail. **[9]**

Q3) a) Explain ART1 network with neat sketch. **[8]**

b) Explain various topologies adopted in ANN and fuzzy Logic. **[8]**

c) Explain Backpropagation learning method with suitable example of atleast three inputs. **[9]**

P.T.O.

SECTION -II

Q4) a) Explain Mamdani Inference system in detail with example. **[8]**

b) Explain various Fuzzy and crisp operators. **[8]**

c) Explain different Inference systems used in fuzzy logic. **[9]**

Q5) a) What is fuzzy Quantifier? Explain in detail. **[8]**

b) Explain different types of functions used in fuzzy logic with neat sketches. **[8]**

c) Explain Air conditioner controller using Fuzzy logic. **[9]**

Q6) a) Explain max-min composition rule used in fuzzy theory. **[8]**

b) Explain Fuzzy Logic system. **[8]**

c) Explain process control example by neural network treatment. **[9]**

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Total No. of Questions :12]

SEAT No. :

P2677

[Total No. of Pages :4

[4660]-247

M.E. (Electrical)(Control System)

ADVANCED DRIVES & CONTROL

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

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Suggest a suitable solid state controller for induction motor driving constant torque load at speed below as well as its normal speed. With the help of speed-torque characteristic of load and that of motor explain the variation of operating speed with the controlled variable. **[8]**

b) Explain the steady-state stability as applied to electric drive system. State the assumptions made in deriving the steady state stability criteria. Explain stability of fan driving induction motor at low speed operating point. Also comment on if the load on the motor is replaced by constant torque demand load and selection of solid state controller. **[10]**

OR

Q2) a) Compare A.C Drive and D.C. Drive on the following points of view:**[10]**

i) Electric motors employed in the drive .

ii) Selection criteria and specialities of the solid state controller units in connection with available supply and nature of output voltage.

iii) Speed control abilities and range available.

iv) Area of application.

P.T.O.

b) With reference to multiquadrant operation of electric drive explain plugging and regenerative braking operation of the electric drive while driving the load. **[8]**

Q3) a) The variable speed of d.c. motor can be obtained by using either converter or chopper. Discuss and compare the armature current in each case of controller, from following points of view. Assume motor is driving full load torque rated speed. **[10]**

i) wave form

ii) ripple and its content

iii) Also discuss on the continuity / discontinuity of the current if the speed is decreased below normal speed.

b) A chopper driven, separately excited d.c. motor of 220 volts, 1000 rpm, 10 Amp, has its armature resistance of 2 ohms. It the chopper is fed by 230 volts and operated at 500 Hz frequency, determine its duty ratio when motor is loaded with 1.2 times full load torque at 500 rpm. **[6]**

OR

Q4) a) The separately excited d.c. motor is delivering half the full load torque constantly. It is proposed to employ the field weakening method of control of speed. State and explain this method to be employed using solid state controllers. Also comment on the continuity of armature current. **[8]**

b) A TRC chopper is supplying armature of a separately excited d.c. motor to result wide variation down upto low values of speeds. If additional inductance is inserted in series with the armature. Explain in connection with the performance of the controller the following: **[8]**

i) Variation in duty cycle.

ii) Continuous / discontinuous conduction.

iii) Output delivered by the motor.

Q5) Explain in detail the impact of nonsinusoidal excitation supplied by the inverter to the windings of induction motor. Explain time and space harmonics and their location of existance. How does the performance of the motor get affect? Explain with the help of the equivalent circuit of induction motor for low harmonics. Also explain torque pulsation. **[16]**

OR

Q6) In respect of speed control of induction motor explain with the help of circuit diagram, the control strategy, the technique of reversal of direction of rotation, complexities, number of power components used in a voltage source inverter.

Also compare the same if the current source inverter is employed for speed control. **[16]**

SECTION -II

Q7) Explain in connection with the speed control of induction motor, the following: **[16]**

a) Scaler control

b) Dynamic d-q model

c) Direct vector control

d) Indirect vector control

OR

Q8) Explain in respect of speed control of induction motor, the slip power recovery and the static KRAMER control drive. **[16]**

Q9) a) Explain construction and principle of operation of SWITCHED RELUCTANCE motor. Draw necessary diagrams including drive circuit to be employed in the control of the motor. **[8]**

b) Explain in detail the construction, working principle of TRAPEZOIDAL SPM machine drive. **[8]**

OR

Q10) Write in detail the note on:

a) Permanent magnet motors and its solid state controllers. **[8]**

b) Wound field machine drive. **[8]**

Q11) a) The closed loop control of the industrial drive employs current-control. Explain the design procedure in detail. **[9]**

b) Explain in detail micro computer control in the modern trends of drive control. **[9]**

OR

Q12) a) Explain in detail phase locked loop control strategy. **[6]**

b) Explain the effect of RMS voltage variation on the performance of the solid state controlled drives. **[6]**

c) Write a note on Industrial application of the PID controller. **[6]**

EEE

Total No. of Questions : 6]

SEAT No. :

P3398

[Total No. of Pages : 2

[4660] - 249

M.E. (Electrical) (Power Systems)

COMPUTER APPLICATIONS IN POWER SYSTEM

(Semester - I) (2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain Lagrange method for solution of optimal problem. State its merits also. **[12]**

b) In context with optimization of an engineering problem explain design vector, design constraints, surface, objective function, classification of optimization problem. **[13]**

Q2) a) What are different indirect search method? Explain any one in detail. **[13]**

b) Discuss unimodal functions and their role in optimization. **[12]**

Q3) a) With flow chart discuss Newton Raphson method using rectangular coordinates. **[15]**

b) Discuss decoupled load flow method with mathematical formulation of it. **[10]**

P.T.O.

SECTION - II

Q4) a) Explain Newton's method used for optimal generation scheduling. **[10]**

b) Explain following in context to economic dispatch. **[15]**

i) Calculation of loss factors using sensitivity factors.

ii) Generation shift distribution factors.

iii) Linear programming method.

Q5) a) Explain economic load dispatch with inclusion of loss coefficient. **[12]**

b) Formulate AC-DC load flow problem. **[13]**

Q6) a) Explain necessity of three phase load flow. Also deduce mathematical expressions used in three phase load flow problem. **[12]**

b) Formulate sequence impedance matrix for unsymmetrical faults. **[13]**

Total No. of Questions :6]

SEAT No. :

P2679

[Total No. of Pages :2

[4660]-251
M.E. (Electrical) (Power System)
POWER SYSTEM MODELLING
(2008 Pattern) (Semester - I) (503203)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers any two from each section.***
2) ***Answer to the two sections should be written on separate answer books.***
3) ***Assume suitable data if necessary.***
4) ***Write down all the assumptions made.***

SECTION -I

Q1) a) Explain the systematic procedure to develop mathematical model of physical system. Explain various ways of Power system modeling. What is the simulation in power system? **[13]**

b) Develop the mathematical model of lossless long transmission line. Obtain nominal 'π' model of the line from it. State the assumptions if any. **[12]**

Q2) a) State and explain the function of phase shifting transformer and then develop a mathematical model for phase shifting transformer. **[13]**

b) Derive the mathematical model of hydraulic turbine and state assumptions involve in it clearly. **[12]**

Q3) Derive the stator and rotor voltage equations and torque equation in *dq0* frame of reference for synchronous machine represented by model 1.1.**[25]**

SECTION -II

Q4) A round rotor synchronous generator is represented by an EMF behind a synchronous reactance. For this machine governor controls the shaft input power and the excitation system controls the internally generated EMF E_g. A synchronous generator is operating at a lagging power factor with current I_1, internally generated voltage E_{g1}, and terminal voltage V_t. Assume that the input power is held constant by governor. With these initial operating conditions,

P.T.O.

assume that the excitation is increased to new value E_{g2}. Assume that the bus voltage is held constant by other machine operating in parallel with this machine.

Draw equivalent circuit diagram and with the help of phasor diagram, determine the new value of current I_2, the new power factor $cos\ \Phi_2$, and the new torque angle δ_2. Also comment on the results for the change in power. **[25]**

Q5) Short note on: **[25]**

a) Static VAR compensators.

b) d-q transformation using α-β variables.

Q6) Discuss the significance of voltage regulator in power system. Explain with the help of suitable block diagram, the working of electromechanical and solid state voltage regulators. **[25]**

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Total No. of Questions : 6]

SEAT No. :

P2680

[Total No. of Pages : 2

[4660]-252

M.E. (Electrical) (Power System)

a - DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS

(Semester - I) (2008 Pattern) (Elective - I) (503204)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) State the concepts of aliasing and quantization in discrete systems. **[8]**

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

i) Time variant and time in variant systems.

ii) Causal and non-causal systems.

iii) Dynamic and static systems.

c) Explain the following methods for finding inverse z transform **[8]**

i) Partial fraction.

ii) Method of long division.

Q2) a) Find the linear convolution of the following two sequences using circular convolution. **[8]**

$$x(n)=\left\{1,\underset{\uparrow}{2},0,4\right\} h(n)=\left\{-1,-1,\underset{\uparrow}{2},3\right\}$$

b) Explain Radix 2 FFT-DIT algorithm. **[12]**

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

P.T.O.

Q3) a) Compare FIR filters with IIR filters. **[6]**

b) Obtain direct form, cascade form and parallel form realization of the following FIR filter. **[9]**

$$H(z)=(1+5z^{-1}-3z^{-2})(1+z^{-1}-2z^{-2})$$

c) Explain in details the designing of FIR filters using windows technique. **[10]**

SECTION - II

Q4) a) Explain the steps involved in designing discrete low pass Butterworth filter. **[9]**

b) Explain various methods to obtain digital IIR filter from analog filter. **[8]**

c) Explain different realizations of IIR filters. **[8]**

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

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

i) Pipelining.

ii) Effect of finite word length.

iii) Multiple Access Memory.

iv) Data Address Generator.

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

b) Write a detailed note on 'DSP based power factor correction'. **[9]**

Total No. of Questions : 12]

SEAT No. :

P2681

[Total No. of Pages : 3

[4660]-253

M.E. (Electrical) (Power Systems)

b - ADVANCED POWER ELECTRONICS

(2008 Pattern) (Elective - I) (Semester - I) (503204)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the Constructional features, characteristics and specifications of MCT and compare with SCR. **[8]**

b) Explain constructional details of GTO to explain turn off capability in comparison to SCR. **[8]**

OR

Q2) a) Explain characteristics of IGBT in comparison to BJT. Why power devices need to be protected against high temperature rise? **[8]**

b) What is SOA? Draw and compare MOSFET and BJT SOA. **[8]**

Q3) a) Explain operation of 3phase full bridge converter feeding highly inductive load. Comment on the range of control with continuous load current. **[10]**

b) How PWM control is used for harmonic control? What is SHE(Selective Harmonic Elimination)? Explain. **[8]**

OR

P.T.O.

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

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

Q5) a) Draw neat circuit and explain working of self commutated CSC. **[8]**

b) Compare CSC with VSC with help of circuit diagram, devices used and applications. **[8]**

OR

Q6) a) Explain working of line commutated CSC. **[8]**

b) What are the advantages of CSC compared to VSC? Explain with help of circuit diagram, and Control techniques. **[8]**

SECTION - II

Q7) a) What are various features of Multi level inverters? Compare with multi pulse converters. **[8]**

b) Draw neat circuit for 3 level cascaded Multilevel inverter and explain how harmonic control is achieved? Which harmonics are eliminated? **[8]**

OR

Q8) a) Explain working of capacitor clamped multilevel inverter. What are advantages in comparison with other types? **[8]**

b) What are the applications of multilevel inverters? Explain any one. **[8]**

Q9) a) Explain the need for harmonic filters? What are various types available? Explain any one. **[10]**

b) Explain working principle of Superconducting Magnetic energy storage system. (SMES). **[8]**

OR

Q10)a) Compare series and shunt type Active filter with help of neat diagram? **[10]**

b) Explain working principle of Flywheel energy storage system. **[8]**

Q11)a) Explain the conventional active and reactive power in three phase system and need for d-q transformations with non linear loads? **[8]**

b) What is active and reactive power expressions of 3phase 4wire system using Akagi's instantaneous power (pq) theory? **[8]**

OR

Q12)a) What are $\alpha\beta$ transformations? Write relations for 3 phase balanced voltage systems to obtain $\alpha\beta$ components. **[8]**

b) Explain Akagi's instantaneous power (pq) theory used for harmonic power compensation? **[8]**

Total No. of Questions : 6]

SEAT No. :

P2682

[Total No. of Pages : 2

[4660]-254

M.E. (Electrical - Power Systems)

ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS IN POWER SYSTEMS

(2008 Course) (503205) (Semester - I) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain any three applications of Fuzzy logic and Artificial Neural network for solving problems in power system. **[10]**

b) Write short note on following with examples: **[15]**

i) Fuzzy relations and operations on fuzzy sets.

ii) Height of a fuzzy logic.

iii) Normalization of a fuzzy set.

Q2) a) Explain the generation of membership function based on subjective perception and inductive reasoning. **[10]**

b) Explain following methods of associating crisp set with a given fuzzy set. **[15]**

i) Core of a fuzzy set.

ii) Support of a fuzzy set.

iii) Level set associated with a fuzzy set.

iv) α-cuts of a fuzzy set.

P.T.O.

Q3) Explain 'Predicate Logic' PL (2) with reference to following points giving appropriate examples. **[25]**

a) Syntax of PL (2).

b) Semantics of PL (2).

c) Semantic Properties.

d) Derivation.

e) Resolution in PL(2).

SECTION - II

Q4) a) Compare operational logic as well as functional properties of Artificial Neural Network (ANN), Expert System and Fuzzy Logic. **[10]**

b) Explain basic McCullock Pitts' non linear model of a neuron with diagram and mathematical relations. **[8]**

c) Explain different transfer functions used to map input-output relation while training ANN. **[7]**

Q5) a) Define learning of artificial neural network. **[5]**

b) Explain algorithm of 'Perceptron learning Rule'. Explain 'learning rate' and 'momentum coefficient'. **[10]**

c) Explain the competitive learning of neural network. **[10]**

Q6) a) With neat diagram explain the architecture of Multi-Layer Perceptron (MLP). Also explain basic rules of signal flow graph. **[10]**

b) Explain the error back propagation algorithm with mathematical formulae. **[15]**

Total No. of Questions : 6]

SEAT No. :

P2683

[Total No. of Pages : 2

[4660]-255

M.E. (Electrical) (Power System)

b - RENEWABLE ENERGY SOURCES

(2008 Course) (503205) (Elective - II) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Highlight on worldwide potentials of conventional and nonconventional Energy Resources and comment on same. **[10]**

b) Explain the concept of clean Development Mechanism and prototype carbon funds. **[10]**

c) Explain the chracteristics of PV cells. **[5]**

Q2) a) State and explain different types of solar collector. **[10]**

b) Highlight on stand alone and grid connected operation of wind energy. **[10]**

c) Write a note on IRP. **[5]**

Q3) a) Discuss on Wind distribution and wind speed predictions. **[10]**

b) Discuss on system components and types of turbine related to wind Energy Generation. **[10]**

c) List the system design factors for wind energy. **[5]**

P.T.O.

SECTION - II

Q4) a) Discuss on energy contents and technological advancements related to biomass. **[10]**

b) Write a note on Geothermal energy conversion systems. **[10]**

c) Write a note on Micro Hydel Plant. **[5]**

Q5) a) Explain the equivalent circuit and performance characteristics battery as storage device. **[10]**

b) Explain the Fly wheel energy components and its advantages over battery. **[10]**

c) Write a note on battery management. **[5]**

Q6) a) Explain the hybrid system combined with diesel. **[10]**

b) How does power quality gets affected due to voltage sags and flickers. **[10]**

c) High light on load scheduling. **[5]**

Total No. of Questions : 6]

SEAT No. :

P2684

[Total No. of Pages : 2

[4660]-256
M.E. (Electrical) Power Systems
Power System Dynamics
(2008 Course) (503208) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two from each section.***
2) ***Answers to the two sections should be written on separate answer books.***
3) ***Assume suitable data if necessary.***
4) ***Write down all the assumptions made.***

SECTION - I

Q1) a) Classify the various states of operations and the security of the system as per Dy Liacco, and Fink and Carlson. **[12]**

b) Explain in detail analysis of steady state stability. State the criterion for it. How Eigen value analysis is used for the purpose of stability analysis. **[13]**

Q2) a) Derive the stator voltage expressions for the small signal analysis of single machine model with field circuit only. Write down assumptions involve in it. **[13]**

b) Explain the role of SVC in power system. Explain the control characteristics of SVC in detail. **[12]**

Q3) Write short notes on: **[25]**

a) Equal area criterion and its application

b) Effect of excitation control on steady state stability.

c) Synchronous machine models.

P.T.O.

SECTION - II

Q4) What is power system stabilizer (PSS)? Explain it with the help of neat block diagram. Explain the working of each component of PSS in detail. **[25]**

Q5) Derive an expression for small signal analysis of multimachine system considering simplified model of synchronous machine. State any assumption made. **[25]**

Q6) a) Explain the analysis of voltage stability of SMLB system with the help of **[13]**

i) PV curve and

ii) VQ curve

b) Assume hypothetical case of islanding and Discuss the implications of inadvertent islanding. **[12]**

Total No. of Questions : 6]

SEAT No. :

P2685

[Total No. of Pages : 2

[4660]-257

M.E. (Electrical) (Power System)

Power System Planning & Reliability

(503209) (2008 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are load forecasting methods. **[8]**

b) Why there is a need for power system planning in power system hence give sketch for planning of power system. **[8]**

c) Explain probability based Markov Process to evaluate reliability. Also enlist other probabilistic methods used in system planning. **[9]**

Q2) a) Explain Long term planning and discuss one of method in long term planning. **[8]**

b) Explain Extrapolation technique used in load forecasting. **[8]**

c) Define reliability hence explain reliability indices for sustained interruptions. **[9]**

Q3) a) What are different kind of loads present hence explain Load growth characteristic. **[8]**

b) Explain reactive power planning. **[8]**

c) Explain Momentary indices in reliability. **[9]**

P.T.O.

SECTION - II

Q4) a) Explain importance of Probability study required in generator planning hence explain various probability methods. **[8]**

b) What is network reconfiguration? How reconfiguration is needed for reliability improvement. **[8]**

c) What is the effect of bus-bar failure in evaluation of distribution system reliability. **[9]**

Q5) a) Explain Integrated resource planning used in generation planning for reliability improvement. **[8]**

b) Draw a neat sketch of transmission planning and explain transmission planning functions. **[8]**

c) How distribution system reliability will improve? **[9]**

Q6) a) Explain factors affecting interconnection under emergency assistance. **[8]**

b) Explain transmission planning to enhance reliability indices specially system point and load point indices. **[8]**

c) What is reliability cost? What are the parameters affected on reliability cost? **[9]**

Total No. of Questions : 6]

SEAT No. :

P2686

[Total No. of Pages : 2

[4660]-258

M.E. (Electrical - Power Systems)

High Voltage Power Transmission

(2008 Course) (503210) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the nature of overvoltage due to lightening phenomenon, with the help of wave-shape and specifications. **[10]**

b) Explain the reasons of occurrence of switching over voltage; also explain the means to minimize the switching over voltage. **[15]**

Q2) a) Write short note on following: **[15]**

i) Advantages of high voltage AC lines,

ii) Statistical approach of insulation coordination.

iii) Necessity of Reactive power compensation.

b) Explain the principle of radio interference, origin of radio interference and factors to be considered in line design. **[10]**

Q3) a) Write short note on following ways of voltage control: **[15]**

i) Tap changing transformer.

ii) Shunt rectors and shunt capacitors.

b) What are the biological effects of electric field? Also state the safe values of electric field. **[10]**

P.T.O.

SECTION - II

Q4) a) Give comparative study between EHV AC and HVDC Transmission system. **[10]**

b) Explain the connections of three phase six pulse and twelve pulse converter bridges. Draw and explain the voltage and current waveforms. **[15]**

Q5) a) Explain the switching arrangements in a bipolar HVDC terminal and sequence of switching operations. **[12]**

b) Explain the types of multi-terminal HVDC systems along with their control characteristics, configurations. **[13]**

Q6) a) Explain the ways of protection in HVDC system such as pole wise segregation, clearing of DC line faults and reenergizing, protection of converters. **[15]**

b) Explain the hierarchical levels of control of HVDC system. **[10]**

Total No. of Questions : 6]

SEAT No. :

P2687

[Total No. of Pages : 2

[4660]-259

M.E. (Electrical) (Power System)

a - DIGITAL POWER SYSTEM PROTECTION

(2008 Pattern) (Elective - III) (503211) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain working of numerical relay with the help of a block diagram. **[10]**

b) Explain Least Error Squared (LES) technique. **[15]**

Q2) a) Explain amplitude comparison relay based on travelling wave phenomenon. **[10]**

b) With a block diagram explain hardware of a microprocessor based relaying scheme for protection of transmission line. **[15]**

Q3) a) Explain different faults in a synchronous generator. **[5]**

b) Explain % differential protection scheme for synchronous generator. **[10]**

c) Explain protection against turn - to - turn fault on stator winding. **[10]**

SECTION - II

Q4) a) In a transformer explain how magnetising inrush current and overvoltage inrush current are considered in protection. **[15]**

b) Explain Buchholz Relay. **[10]**

P.T.O.

Q5) a) Explain multi-zone distance Relaying scheme. **[15]**

b) Explain features of man-machine interface system and integrated operation of national power system. **[10]**

Q6) a) What are the assumptions made in S.C. studies for designing relaying scheme. **[10]**

b) Develop algorithm for S.C. studies. **[15]**

Total No. of Questions : 12]

SEAT No. :

P2688

[Total No. of Pages : 3

[4660]-260

M.E. (Electrical) (Power Systems)

b - POWER ELECTRONICS APPLICATIONS IN POWER SYSTEMS (PEAPS)

(2008 Pattern) (Elective - III) (503211)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Classify different types of static power converter topologies used. Comment on the output, harmonic control in a transmission line. **[8]**

b) Compare Series Compensation and Shunt Compensation? Explain any one method for series compensation in detail along with diagram. **[8]**

OR

Q2) a) Explain FC TCR topology with neat diagram and characteristics. **[8]**

b) Draw Impedance Vs delay angle characteristics of TCSC and explain its operation. **[8]**

Q3) a) What is the most suitable location for shunt compensation placement? Why? **[8]**

b) With neat figure explain the principle of operation of Thyristor Controlled Reactor (TCR). Obtain the expression for effective reactive admittance and RMS value of fundamental and nth harmonic current. **[8]**

OR

P.T.O.

Q4) a) How SSSC can be used for active and reactive power flow control of transmission network? Compare characteristics and features of TSSC with SSSC. **[10]**

b) Compare FC TCR and TSC TCR based on characteristics offered. **[6]**

Q5) a) Explain TCSC with its V-I characteristics. Explain its Voltage control and reactance control modes of operation. **[10]**

b) Draw V-I characteristics of TSC TCR and Explain its modes of operation. **[8]**

OR

Q6) a) Comment on control range and VA rating of SSSC using V-I characteristics in Voltage control and reactive control mode of operation. **[10]**

b) Draw and explain switching converter type series compensator functional diagram. **[8]**

SECTION - II

Q7) a) Explain functional control of shunt and series converter in UPFC. What are the different modes of operation? **[8]**

b) What are the operational constraints in UPFC? **[8]**

OR

Q8) a) What is UPFC? Draw diagram to explain basic principle of operation of UPFC. **[8]**

b) With the help of expressions and P-Q/δ plots, comment on range of real and reactive power control of UPFC. **[8]**

Q9) a) Explain principle of working for TCPAR with the help of diagram and expressions. **[8]**

b) Explain principle of working of Dynamic Voltage Regulator/Restorer (DVR). **[8]**

OR

Q10)a) What is TCBR? Draw circuit diagram and explain its working modes. **[8]**

b) Compare different FACTS controllers used for reactive compensation. **[8]**

Q11)a) What are various control strategies used in various FACTS devices? Discuss their comparative merits. **[10]**

b) Compare Hysteresis and Fuzzy logic controls. **[8]**

OR

Q12)a) What is ANN control? Explain. **[10]**

b) Comment on importance of coordination between different FACTS controllers. **[8]**

Total No. of Questions : 6]

SEAT No. :

P2689

[Total No. of Pages : 2

[4660]-261

M.E. (Electrical - Power Systems)

Power Quality Assessment & Mitigation

(503212) (2008 Course) (Elective - IV) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the symptoms of poor power quality? Can good grounding system reduces problems of power quality. How? **[12]**

b) What are different power quality issues? How power quality events are classified and characterized? **[13]**

Q2) a) Explain control strategies for transient voltages. **[12]**

b) Differentiate between voltage transient and voltage flicker. Explain mitigation methods of voltage flickers. **[13]**

Q3) a) Why voltage sag is important power quality event compared to other events? Also explain economic impact of voltage sag. **[10]**

b) Explain CBEMA and ITIC curves. **[5]**

c) What are the differences between Over voltage and Swell? Explain mitigation techniques for swells? **[10]**

P.T.O.

SECTION - II

Q4) a) Explain effect of harmonics on consumer electronic appliances, communication circuits, power capacitors, and induction motors. **[15]**

b) Explain following in context to harmonics. **[10]**

i) Total demand distortion and total harmonics distortion.

ii) True power factor and distortion power.

Q5) a) Explain passive harmonic filter design criteria. Also high light design constraints on filter components. **[12]**

b) Explain approaches followed in power quality monitoring. **[13]**

Q6) a) Explain role of power instrumentation in power quality assessment. Also explain important features of power quality monitors. **[13]**

b) Power quality state estimation and importance of the same in controlling. **[12]**

Total No. of Questions : 6]

SEAT No. :

P2690

[Total No. of Pages : 2

[4660]-262

M.E. (Electrical - Power Systems)

b-PARTIAL DISCHARGES IN ELECTRICAL POWER APPARATUS

(Elective - IV) (503212) (2008 Revised Course) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain following types of discharges such as internal discharge, surface discharge and external discharges. **[18]**

b) Explain the recurrence of PD pulses in relation to the temporarily assigned instantaneous value of high voltage. **[7]**

Q2) a) Explain the necessity of calibration of Partial Discharge (PD) measuring setup. Explain in detail, the procedure of calibration of PD measuring unit. Also explain the reasons for uncertainty of measurement. **[18]**

b) Explain the criterion of choice between straight and balanced detection system. **[7]**

Q3) Write short note on: **[25]**

a) Completely enclosed screen, materials used for screening.

b) Screen interruptions.

c) Effect of corners.

d) Cavity resonance.

e) Measurement of screening efficiency.

P.T.O.

SECTION - II

Q4) Explain the effects of Partial Discharge on following type of dielectrics. **[25]**

a) Gaseous insulating materials.

b) Liquid insulating materials.

c) Solid insulating materials.

Q5) a) Explain the relation between measured and actual charge. **[8]**

b) Explain the relation between the time-dependent occurrence of Partial Discharge. **[8]**

c) Explain the occurrence of damage due to partial discharge. **[9]**

Q6) a) Explain the problems during Partial Discharge measurement on long cables. **[10]**

b) What is the significance of knowing location of partial discharge? Explain the methods to locate PD. **[15]**

Total No. of Questions : 8]

SEAT No. :

P2691

[Total No. of Pages : 3

[4660]-264

M.E. (Electrical) (Power Electronics & Drives)

MODELING AND ANALYSIS OF ELECTRICAL MACHINES

(503301) (2008 Pattern) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain with necessary sketches, the concept of 2-pole primitive machine. What is Kron's primitive machine. **[8]**

b) Discuss and develop the voltage equations for Kron's primitive machine. State all the assumptions made. **[10]**

Q2) a) Using voltage equation matrix of primitive machine, derive the expression for the electrical torque. Explain significance of various terms of torque expression. **[8]**

b) Sketch and explain representation diagrams of basic two-pole machine and primitive machine for the following machines: **[8]**

i) Polyphase induction machine.

ii) DC compound machines.

Q3) a) What is meant by 'power invariance' in transformation theory applied to Electrical machines? Discuss the cases of

i) change in winding turns and

ii) change in current for the equivalence of mmfs. **[8]**

b) Derive the transformations for currents between two-phase (α, β) rotating balanced winding and pseudo-stationary two-phase (d-q) winding. Also, show that the transpose of current transformation matrix is equal to its inverse. **[10]**

P.T.O.

Q4) a) For given a current connection matrix as [C], how the new voltage matrix and transformed impedance matrix are developed? **[8]**

b) A three-phase induction motor has following parameters referred to stator: **[8]**

Stator resistance per phase: 0.19 Ω

Rotor resistance per phase: 0.42 Ω

Stator and rotor leakage reactance per phase: 2.4 Ω each

Magnetising reactance: 27 Ω

Calculate the similar parameters for its equivalent 2-phase induction motor if its per phase winding turns are:

i) same as that of 3-phase induction motor

ii) 3/2 times that of 3-phase induction motor.

SECTION-II

Q5) a) Starting from the mathematical model of a three-phase induction motor, derive an expression for steady state torque. **[10]**

b) Write down the generalized mathematical model of polyphase induction machine and hence derive the steady state voltage equations in phasor form. **[8]**

Q6) a) From the equivalent circuit derive an expression for the air-gap power in terms of rotor resistance, slip etc. Use steady state voltage equations in phasor form and draw the equivalent circuit for a polyphase induction machine. **[8]**

b) Write short notes on 'Dynamic performance of 3-phase Induction motor' subjected to **[8]**

i) Sudden changes in load torque

ii) a 3-phase fault at the machine terminals. Sketch the time response behavior for changes in speed, torque, voltages and currents.

Q7) a) A 3-phase 50 Hz cylindrical-rotor synchronous machine has the following parameters: **[8]**

Armature leakage inductance = 0.38 mH

Self-inductance for phase a = 2.14 mH

For this machine calculate the mutual inductance between armature phases and its synchronous reactance.

b) How this mutual inductance differs or modified for a cylindrical-rotor synchronous machine. Derive expressions for armature mutual inductance of salient pole synchronous machine from a consideration of its basic parameters. **[10]**

Q8) a) Explain transformation of voltage and torque equations using interconnection matrix in interconnected machines, namely dc motor-dc generator machine. **[8]**

b) Write short notes on small displacement stability and Eigen values of typical induction machine. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P2693

[Total No. of Pages : 2

[4660]-266
M.E. (Electrical) (Power Electronics & Drives)
POWER ELECTRONICS DEVICES AND CIRCUITS
(503303) (2008 Pattern) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from Section-I and any two questions from Section-II.***
2) ***Answers to the two sections should be written in separate answer sheet.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Explain two driving circuits for each SCR and MOSFET. **[15]**

b) What is safe operating area. Explain in relation with MOSFET, IGBT. **[10]**

Q2) a) What is need of isolation between power circuit and control circuit? Explain different isolation circuits. **[15]**

b) What is need of snubber to power semiconductor devices? Explain turn off snubber. **[10]**

Q3) a) Explain the operation of type A and type B chopper with output voltage and current waveform. **[10]**

b) Explain switching and V-I characteristics of SCR, MOSFET and GTO. **[15]**

SECTION-II

Q4) a) Explain single phase fully controlled converter with output voltage and current waveform with R-L load. Derive steady state equation for single phase converter for R and RL load. **[15]**

b) Explain dual converter and its circulating and noncirculating current mode of operation. **[10]**

P.T.O.

Q5) a) A three phase transistorized voltage source inverter is supplying a 3 phase balance load. Draw the complete circuit diagram of the inverter including commutating components. Mention the sequence of incoming as well as outgoing transistor along with conducting transistor with reference to the output voltage waveform. **[15]**

b) Compare different PWM control strategies for inverter. **[10]**

Q6) a) What are advantages and disadvantages of bidirectional control. Explain three phase bidirectional controller with R load with necessary waveforms. **[15]**

b) What is cycloconverter? Explain working of cycloconverter with output voltage waveform. **[10]**

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Total No. of Questions : 12]

SEAT No. :

P2694

[Total No. of Pages : 3

[4660]-267
M.E. (Electrical) (Power Electronics & Drives)
a-DSP AND ITS APPLICATIONS IN ELECTRIC DRIVES
(503304) (2008 Pattern) (Semester-I) (Elective-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section-I and three questions from Section-II.***
2) ***Answer to the two sections must be written on separate answer sheet.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION-I

Q1) a) State the basic discrete-time sequences (signals). Represent those graphically & mathematically. **[8]**

b) Find the convolution sum of the following two sequences using Matrix method- $x(n) = \delta(n+1) - 2\delta(n) + \delta(n-1)$ $h(n) = 2\delta(n-1) - 3\delta(n-2)$. **[10]**

OR

Q2) a) Explain with example the following basic operations on discrete time signals- **[8]**

i) Time Shifting ii) Time Reversal

iii) Time Scaling iv) Amplitude Scaling

b) Determine the output response $y(n)$ if

$x(n) = \{1, 2, 3, 2\}$; $h(n) = \{1, 2, 2\}$

Use Graphical Method. **[10]**

P.T.O.

Q3) a) Define discrete time fourier transform. State and prove its any four properties. **[8]**

b) Determine Z transform of $x(n) = n(-1)^n u(n)$ and its ROC. **[8]**

OR

Q4) a) Define Z-transform. Explain ROC. State the condition for existence of Z-transform. **[6]**

b) Determine the Inverse Z-Transform of **[10]**

i) $X(z) = \frac{z}{3z^2 - 4z + 1}$ using Partial Fraction Expansion Method for ROC $|z| > 1$.

ii) $X(z) = \frac{z+1}{z^2 - 3z + 2}$ For casual sequence using Long Division Method.

Q5) a) Explain ideal low pass and high pass frequency filters with phase distortion and delay. **[8]**

b) Explain frequency response of single pole or zero system. **[8]**

OR

Q6) a) Explain concept of stability and causality with inverse system for first order and system with a zero in ROC. **[8]**

b) Explain generalized phase system (GLPS) with linear phase. **[8]**

SECTION-II

Q7) a) State and prove any four properties of DFT. **[8]**

b) Obtain DFT of- **[8]**

i) $h(n) = 1/3 \quad 0 <= n <= 2$

$= 0 \quad$ otherwise

ii) $h(n) = \delta(n - n_0)$

OR

Q8) a) Explain Radix 2 DIT FFT algorithm for computing 8 point DFT. **[8]**

b) How linear convolution is obtained from circular convolution. Obtain linear convolution using circular convolution **[8]**

$X(n) = \{1, 2, 3\}$; $h(n) = \{-1, -2\}$.

Q9) a) Compare analog filters with digital filters. **[4]**

b) State steps to design a digital filter using impulse invariance method. **[6]**

c) Design a digital high pass butterworth filter using bilinear transformation. Specifications of the filter are as follows: **[8]**

$\alpha_p = 1$dB; $\alpha_s = 15$dB; $\Omega p = 0.4\pi$; $\Omega s = 0.2\pi$; T = 1 sec.

OR

Q10)a) Compare FIR and IIR filters. **[4]**

b) Explain rectangular window method for design of FIR filter. **[6]**

c) Design FIR filter using Hamming window with N = 7. **[8]**

$$Hd(e^{jw}) = e^{-j3w} \qquad -\pi/4 <= w <= \pi/4$$

$$= 0 \qquad \pi/4 < |w| < \pi$$

Q11)a) Obtain direct form I, direct form II, cascade form and parallel form of following system **[8]**

$$Y(n) = y(n-1) - \tfrac{1}{2}\, y(n-2) + \tfrac{1}{4}\, y(n-3) + x(n) - x(n-1) + x(n-2)\,.$$

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

i) DSP based motor control system.

ii) DSP based vibration analysis.

OR

Q12)a) Explain basic structures of FIR filters. **[8]**

b) Write short notes on Any One: **[8]**

i) DSP based power factor correction.

ii) DSP based spectrum analysis.

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Total No. of Questions : 6]

SEAT No. :

P3465

[Total No. of Pages : 2

[4660] - 270

M.E. (Electrical) (Power Electronics and Drives)

FACTS AND HVDC

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt two questions from SECTION - I and two questions from SECTION - II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) With the help of neat diagram explain the working of static VAR compensation. **[12]**

b) Explain what is the need of reactive power Compensation in transmission line. **[13]**

Q2) a) What is the difference between Series compensation and Shunt Compensation? Explain any one method for series compensation in detail along with diagram. **[15]**

b) Explain the principle of operation of Thyristor Switched Capacitors (TCS). **[10]**

Q3) a) What is Unified Power Flow? Explain the working of Unified Power Flow Control (UPFC) with the help of neat diagram. **[12]**

b) What are the different types of FACTS controller used for power system stability? Explain the basics of STATCOM along with its block diagram and applications. **[13]**

P.T.O.

SECTION - II

Q4) a) Compare AC and DC Transmission system on the basis of economy, technical performance and reliability. Also discuss the merits and demerits of HVDC system over AC Transmission system. **[15]**

b) Draw a schematic diagram of a typical HVDC converter station and explain the working of each part of it in detail. **[10]**

Q5) a) With the help of neat diagram and necessary waveforms explain the working of 6 pulse bridge converter. **[15]**

b) What are the different faults occurred in converter circuit? Discuss the protection provided against it. **[10]**

Q6) a) From fundamentals explain basic principle of DC link control? Draw and explain basic converter control characteristics. **[12]**

b) Discuss firing angle control and explain the basic requirement for firing angle generation. Explain any one type of firing angle control in detail. **[13]**

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Total No. of Questions : 6]

SEAT No. :

P3464

[Total No. of Pages : 2

[4660]-271

M.E. (Electrical) (Power Electronics and Drives)

HARMONICS AND THEIR MITIGATION

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer two questions from Section I and two questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Your are advised to attempt not more than four questions.***
7) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
8) ***Assume suitabe data, if necessary.***

SECTION - I

Q1) a) Explain different sources of harmonic pollution. **[15]**

b) Which are different power quality issues present. **[10]**

Q2) a) Explain the effect of power quality problem on equipments with remedy. **[15]**

b) Enlist different Harmonic elimination techniques. **[10]**

Q3) a) What are Effects of harmonic distortion. **[15]**

b) Explain steps for passive Harmonic filter design. **[10]**

P.T.O.

SECTION - II

Q4) a) Explain power quality monitoring equipments. **[15]**

b) Explain different Power quality reliability indices. **[10]**

Q5) a) Explain different harmonics reduction techniques. **[10]**

b) Explain different devices used to control harmonics in the system. **[15]**

Q6) a) Explain shunt type Active power filter. **[15]**

b) Explain operating characteristics of SPS. **[10]**

Total No. of Questions : 8]

SEAT No. :

P3325

[Total No. of Pages : 3

[4660]-272

M.E. (Electrical) (Power Electronics & Drives) (Semester - II)

CONTROLLED ELECTRICAL DRIVES

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section - I and three questions from section - II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Discuss the performance of a full converter fed separately excited dc motor under discontinuous and continuous modes of operation. **[8]**

b) A 220 V, 1200 rpm, 15 A separately excited dc motor has armature resistance and inductance of 1.8 Ω and 32mH respectively. This motor is controlled by a full converter having input of 230 V, 50 Hz supply. Identify the modes and calculate torques for **[10]**

i) $\alpha = 60°$ and speed = 450 rpm

ii) $\alpha = 60°$ and speed = 1500 rpm

Q2) a) Draw the necessary sketches and explain two quadrant chopper fed DC drive, controlling armature voltage with constant excitation. What are the demerits of chopper output on the overall performance of the motor. **[8]**

b) A 220 V, 24 A, 100 rpm separately excited dc motor has an armature resistance of 2 Ω. The motor is controlled by a chopper with frequency of 500 Hz and source voltage of 230 V. Calculate the duty ratio for 1.2 times rated torque and 500 rpm. **[8]**

P.T.O.

Q3) a) Explain four quadrant operation in a dual converter fed dc drive for both circulating and non-circulating current operation. **[8]**

b) Derive the output voltage and speed equation in a semi converter fed dc separately excited motor. Discuss maximum and minimum values of currents in continuous conduction mode. **[8]**

Q4) a) Discuss in detail the speed control strategy 'constant volts/Hertz' for 3 phase induction motor. Also, explain drive operating regions with the help of torque-speed curves at variable voltage and frequency up to field weakening region. **[8]**

b) Draw and explain a control schematic block diagram for implementation of VSI fed induction motor drive. **[8]**

SECTION - II

Q5) a) What is the principle of slip power recovery method of speed control? With necessary sketches, explain Static Kramer drive. State the merits of this method of speed control. **[8]**

b) A Y-connected squirrel cage induction motor has following ratings and parameters: 400V, 50Hz, 4-pole, 1370rpm, Rs=2Ω, Rr'=3Ω, Xs=Xr' = 3.5 Ω, Xm=55Ω. It is controlled by a current source inverter at a constant flux. Calculate **[10]**

i) Motor torque, speed and stator current when operating at 30 Hz and rated slip speed.

ii) Inverter frequency and stator current for rated motor torque and motor speed of 1200 rpm.

Q6) a) With necessary diagrams explain the principle of field oriented control. Discuss and compare the philosophy of scalar control and vector control. **[8]**

b) Explain the method of rotor flux estimation in vector control scheme using voltage model and hence derive the estimating equations of rotor flux and rotor angle. **[8]**

Q7) a) Draw and explain a schematic block diagram for implementation of direct vector control method. Write all transformation equations. **[8]**

b) Discuss the dynamic model of separately excited dc motor and derive the transfer function for speed as output and the armature voltage as input. **[8]**

Q8) Write short notes on : **[2 × 8 = 16]**

a) Switched reluctance motor drive

b) Stepper motor drive

Total No. of Questions : 6] **SEAT No. :**

P3418 **[Total No. of Pages :2**

[4660] - 273
M.E. (Electrical) (Power Electronics and Drives)
POWER ELECTRONIC APPLICATIONS
(2008 Pattern)

Time : 3 Hours] ***[Maximum Marks :100***

Instructions to the candidates:

1) ***Answer Two questions from Section-I and Two questions from Section-II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Discuss the role of power electronics in hybrid vehicle. **[12]**

b) How the power electronics is used in battery charging. **[13]**

Q2) a) What is electric traction system? How to provide control to traction Motors? **[15]**

b) Explain the working of 3 phase full bridge converter along with its application. **[10]**

Q3) a) Discuss different utility applications of power electronics. **[15]**

b) With the help of neat diagram explain the working of Air conditioning system. **[10]**

P.T.O.

SECTION - II

Q4) a) Explain the working of UPS? How power electronics is used in it. **[12]**

b) With the help of neat diagram explain the working of wind power system. **[13]**

Q5) a) How power electronics is useful in solar power system? **[10]**

b) Write a short note on SMPS. **[15]**

Q6) a) Write a short note on industrial applications of power system. **[12]**

b) What is HVDC link? How power electronics is useful in it? **[13]**

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Total No. of Questions : 8]

SEAT No. :

P2696

[Total No. of Pages : 2

[4660]-275
M.E. (Electrical) (Power Electronics & Drives)
a-AUTOMATION IN INDUSTRIAL DRIVES
(503311) (2008 Pattern) (Semester-II) (Elective-III)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section-I and three questions from Section-II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

SECTION-I

Q1) a) Discuss four quadrant drive operation. Explain steady state stability. **[10]**

b) Write short notes on selection of motor rating. **[8]**

Q2) a) With all necessary diagrams, explain all electrical braking methods for separately excited dc motor. **[8]**

b) Discuss dynamic modeling of separately excited dc motor. **[8]**

Q3) a) What is constant air gap flux control in induction motor? Draw and explain Implementation diagram for V/F control method for 3-phase induction motor. **[10]**

b) What are the limitations of stator voltage control of induction motor? Explain cycloconverter fed induction motor drive. **[8]**

Q4) a) Write short notes on loss minimization in adjustable speed drives. **[8]**

b) Discuss in brief different Electrical braking methods for 3 phase induction motor. For each method, comment on energy loss and efficiency. **[8]**

P.T.O.

SECTION-II

Q5) a) With necessary sketches, explain adjustable frequency operation of synchronous motor drive. **[10]**

b) Draw the implementation block diagram and explain current fed self-controlled Synchronous motor drive. **[8]**

Q6) a) Write short notes on automation of industrial drive. Name the commonly used sensors and other components used in automation. **[8]**

b) Discuss, how PLC is effectively used to control and protect a industrial drive. **[8]**

Q7) a) Write short notes on recent trends of automation in industry. How SCADA is useful drive automation. **[8]**

b) Explain implementation of sensor less vector control of induction motor. **[8]**

Q8) a) With necessary block diagram, discuss DTC drive system. **[10]**

b) Write short notes on Ladder programming for motor protection. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P2697

[Total No. of Pages : 2

[4660]-277
M.E. (Electrical) (Power Electronics & Drives)
c-MICROCONTROLLER AND ITS APPLICATIONS
(503311) (2008 Pattern) (Semester-II) (Elective-III)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Solve any two questions from Section-I and two questions from Section-II.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

SECTION-I

Q1) a) Enlist the microcontroller family and explain architecture of 8051. **[15]**

b) Write note on: **[10]**

i) reset circuit of 8051
ii) Power down mode in 8051
iii) AD converter interface.

Q2) a) Explain the interrupt structure of 8051 and toggle the LED connected at P1.0 through interrupt pin. **[15]**

b) Explain the generation of sawtooth wave using 8051. Program expected. **[10]**

Q3) a) Write down cross assembler directives used in 8051. **[15]**

b) Write note on state machines. **[10]**

SECTION-II

Q4) a) Explain Solenoids-Relay control and clamping using 8051. **[15]**

b) Discuss interfacing of seven segment display and LCD to 8051. **[10]**

P.T.O.

Q5) a) Enlist any five sensors/actuators and their interface with 8051. **[15]**

b) Explain generation of PWM with 8051. **[10]**

Q6) a) Explain the 8051 based auto synchronizing unit. **[15]**

b) Write short note on intelligent switchgear. **[10]**

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Total No. of Questions : 6]

SEAT No. :

P2698

[Total No. of Pages : 2

[4660]-279
M.E. (Electrical) (Power Electronics & Drives)
b-SPECIAL TOPICS IN POWER ELECTRONICS AND DRIVES
(503312) (2008 Pattern) (Semester-II) (Elective-IV)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from Section-I and any two questions from Section-II.***
2) ***Answers to the two sections should be written in separate answer sheet.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Explain operation of three phase inverter in 180 degree conduction mode with output voltage and pulses waveform. What are different PWM control techniques explain PWM, SPWM inverter. **[15]**

b) How voltage variation is achieved within inverter. Explain different methods. **[10]**

Q2) a) What are the advantages and disadvantages of CSI? Explain current regulated PWM CSI. Draw circuit diagram and output voltage, current waveform. **[15]**

b) What are basic types of switching mode regulators? Explain any two in detail. **[10]**

Q3) a) Explain boost converter with output voltage and current waveform. What are advantages and disadvantages of buck regulator? **[15]**

b) What are different methods of power factor control explain any two methods in detail. **[10]**

P.T.O.

SECTION-II

Q4) a) What are harmonics? What are different IEEE standards for it? **[10]**

b) What are active filters? How single phase active filter be used show and explain with block diagram and associated output. **[15]**

Q5) a) Explain vector control operation of three phase induction motor with block diagram and function of each block. **[15]**

b) What is sensor less controlof induction Motor and explain any one control method for control of IM. **[10]**

Q6) a) What is sensor less control of Synchronous Motor? **[10]**

b) Explain any one adaptive control method for control of Synchronous Motor? **[15]**

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Total No. of Questions : 6]

SEAT No. :

P3326

[Total No. of Pages : 3

[4660]-281

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

ELECTROMAGNETICS AND ANTENNA THEORY

(2008 Revised Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Using method of moments, derive expression for field distribution using integral form of potential equation. **[15]**

b) Write a detailed note on Yee's FD algorithm. **[10]**

Q2) a) Derive the expression for Green's function G corresponding to PDE for free space. **[10]**

b) Compare FEM and FDM and MoM based on various parameters. **[15]**

Q3) a) Derive suitable expressions to calculate impedance of slot antenna of **[15]**

i) Loop antenna

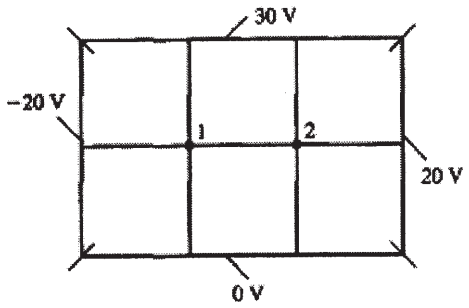
ii) Log periodic antenna

b) Compare the power radiated by the half wave dipole and monopole. **[10]**

P.T.O.

SECTION - II

Q4) Explain the procedure to calculate potentials using FDM and use FDM to calculate the potentials at nodes 1 and 2 in the potential system shown in the following figure. **[25]**



Q5) a) Design rectangular micro strip antenna using substrate with dielectric with constant of 2.2, h = 0.1588cm, so as to resonate ate 10GHz. Give the design procedure. **[10]**

b) Given the far field expressions, define and determine the following parameters for the Hertzian dipole. **[15]**

$$E_\theta = j\eta \frac{\beta I_0 l e^{-j\beta r}}{4\pi r} \sin\theta$$

$$H_\varphi = j \frac{\beta I_0 l e^{-j\beta r}}{4\pi r} \sin\theta$$

i) Radiation Intensity

ii) Radiation Density

iii) Radiation resistance

iv) Radiated power

v) Directivity

vi) HPBW

vii) FNBW

Q6) a) Draw the geometrical diagram of Yagi Uda antenna with all the dimensions. **[8]**

b) Derive the array factor for N-element linear array and explain the pattern multiplication principle. **[8]**

c) Draw the geometrical diagram of Helical antenna and explain various modes, radiation pattern, and design procedure with relevant mathematical expressions and illustrative diagrams. **[9]**

Total No. of Questions : 6]

SEAT No. :

P2699

[Total No. of Pages : 2

[4660]-283
M.E. (E & TC) (Microwave)
RF AND MICROWAVE CIRCUIT DESIGN
(504223) (2008 Pattern) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any two questions from each Section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data whenever necessary.***

SECTION-I

Q1) a) What kind of definition is used for SFDR? Why is the definition reasonable? Calculate the SDFR for receiver with NF = 6dB, $PIIP_3$ = –10dBm, ΔF = 200 kHz, NR_{min} = 10 dB. **[13]**

b) Explain the concept of inter symbol interference (ISI). How ISI affect the wireless communication? Derive for rolloff factor. **[12]**

Q2) a) The n-type three phase surface channel CCD has following specifications. **[15]**

i) Insulator crosssection A = 0.6×10^{-4} cm^2.

ii) Insulator relative dielectric constant $\in_r = 4$.

iii) Power dissipitation allowed per bit = P = 0.7 mw.

iv) Electron density $N_{max} = 2 \times 10^{12}$ cm^{-3}.

v) Insulator thickness d = 1.5 μm.

vi) Clock frequency = 8 MHz.

Compute:

1) The insulator capacitor per square cm.

2) Determine the maximum stored charges per well in coulumbs.

3) Find required gate voltage.

b) Explain in detail IMPATT diode. **[10]**

P.T.O.

Q3) a) What is Gunn effect? How it is used for microwave generation? Discuss Vally model theory along with necessary figures, symbols or diode and voltage characteristic plot. **[15]**

b) Draw generic amplifier system. Discuss stabilization method for transistor amplifier design. **[10]**

SECTION-II

Q4) a) Design a BJT Colpitt oscillator for 320 mHz. The parameters are: V_{CE} = 3V, I_C = 3 mA, C_{bc} = 0.1PF, R_{be} = 2kΩ, R_{CE} = 10 kΩ, C_{be} = 100PF, is the inductance should not exceed $L_3 = L$ = 50nH, find the capacitance in feedback loop. **[13]**

b) An abrupt P-N junction made of Si has acceptor and donor impurity as $N_A = 10^{15}$ cm^{-3} and $N_D = 5 \times 112$ cm^{-3}, assume device operates at room temperature, determine: **[12]**

i) The barrier voltage.

ii) The space charge width.

iii) The peak electric field across the junction. Given the junction capacitance for a cross-sectional area is 10^{-4} cm^2 and $\in_r = 11$.

Q5) a) Compare unilateral and bilateral design approach for microwave amplifier. **[10]**

b) A MESFET operates at 5.7 GHz has the 'S' parameters as $S_{11} = 0.5 \angle -60°$, $S_{12} = 0.02 \angle 0°$, $S_{21} = 6.5 \angle 115°$ & $S_{22} = 0.6 \angle -35°$. Determine: **[15]**

i) If transistor is unconditionally stable. Draw stability circle.

ii) Find the optimum power gain assuming unilateral design ($S_{12} = 0$).

Q6) a) Explain criterion for mixer design. **[10]**

b) Design an 8GHz oscillator in C-B BJT configuration. The 'S' parameters at V_{CE} = 5V and I_C = 20 mA are $S_{11} = 0.87 \angle -40°$, $S_{11} = 0.25 \angle -32°$, $S_{21} = 0.6 \angle 100°$ and $S_{22} = 1.21 \angle 165°$. Draw circuit. **[15]**

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Total No. of Questions : 6]

SEAT No. :

P2700

[Total No. of Pages : 2

[4660]-284
M.E. (E & TC)
a-APPLICATIONS OF MICROWAVE TO RADAR & SATELLITE
(504224) (2008 Pattern) (Elective-I) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Derive the RADAR range equation considering all the losses. **[10]**

b) A RADAR has the parameters: PRF of 2kHz, pulse width 4μs, and average power 200W. Transmitting frequency of 6 GHz, target moving with a radial velocity of 200 km/hr. Find peak power output, duty cycle and doppler frequency. **[15]**

Q2) a) What is RCS? Explain the concept of RCS for perfectly conducting sphere and square plate. **[10]**

b) Explain the Kepler's law of orbital motion of a body in detail along with related depression. **[15]**

Q3) a) Explain with the help of neat diagram the satellite subsystems: Telemetry, Tracking, Command, Power subsystems. **[15]**

b) Explain the FDMA downlinks analysis. **[10]**

P.T.O.

SECTION-II

Q4) a) Explain the power budget analysis in satellite link with suitable mathematical expressions. **[10]**

b) A satellite at a distance of 6000 km from a pilot on the earths surface radiates a power of 3W from an antenna with a gain of 18 dB in the direction of the observer. Find the flux density at the receiving point and the power received by antenna with effective area of 10 m^2. The satellite operates at a frequency of 10 GHz. The receiving antenna has a gain of 50 dB. Find the received power. **[15]**

Q5) a) Explain satellite switched TDMA. **[10]**

b) Exlain the earth and space segment in detail. **[15]**

Q6) a) What is G/T ratio and explain its significance in satellite communications. **[10]**

b) Explain the application of S. A. Radar for ship monitoring. **[15]**

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Total No. of Questions : 8]

SEAT No. :

P3469

[Total No. of Pages : 3

[4660] - 285

M.E. (E&TC) (Microwave)

DIGITAL IMAGE PROCESSING AND ANALYSIS

(2008 Pattern) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***

2) ***Assume suitable data, if necessary.***

3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) With reference to relation between pixels, explain : **[8]**

i) 4 - connectivity

ii) 8 - connectivity

iii) Mixed connectivity

Explain with suitable example where the concept of connectivity is used in Image Processing.

b) Briefly Explain the technique for measurement of Modulation Transfer Function (MTF) of the human vision system using modulated sine-wave gratings and sketch the typical response curve for the MTF. How does one confirm that the human vision response is logarithmic function of input intensity? **[8]**

Q2) a) State the basic formulae DCT and IDCT for two dimensional image data. Illustrate the properties of DCT. **[8]**

b) Compare following image transform techniques using simplicity, energy compactation and computational effort, as parameters. **[8]**

i) K. L. Transform

ii) Discrete Fourier Transform.

iii) Discrete Cosine Transform.

iv) Hadamard Transform.

P.T.O.

Q3) a) Briefly explain following image enhancement techniques. **[8]**

i) Image Averaging

ii) Image Sharpening

b) Explain any two spatial filtering methods for image restoration in presence of only additive noise. **[8]**

Q4) Write short note for any three : **[18]**

a) RGB, Y/Q and HIS models for color Images.

b) Chromatic adaptation and color blindness

c) Optimal thresholding

d) False coloring for Image enhancement

SECTION - II

Q5) a) Explain the following for image compression: **[9]**

i) Entropy and entropy coding methods

ii) Compression ratio and compression ratios used in JPEG and MPEG standards

iii) Psychovisual and interpixel redundancy in images

b) A simple 4 × 4 Image is represented by following matrix: **[9]**

$$\begin{bmatrix} 20 & 140 & 100 & 20 \\ 20 & 140 & 100 & 20 \\ 240 & 140 & 240 & 240 \\ 240 & 140 & 240 & 240 \end{bmatrix}$$

i) Determine the entropy of image.

ii) Coding redundancy in the image.

iii) Generate a simple Huffman code-book for various grey levels in the image.

Q6) a) Explain the following in details: **[8]**

i) Edge linking using Hough Transform.

ii) Chain codes and B-splines for boundary representation.

b) Explain Morphological Image Processing w.r.to Dilation, Erosion, Opening, Closing on Binary image. **[8]**

Q7) a) What are deterministic degradations? Explain typical degradation function for camera motion and camera defocusing effects. How does one restore the degraded image in these situations? **[8]**

b) Explain how Hough transform is helpful in detecting circles in image. **[8]**

Q8) a) Explain Baye's classifier for object recognitation. **[8]**

b) Explain the role of neural network in digital image processing. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2701

[Total No. of Pages : 3

[4660] - 286
M.E. (E & TC) (Microwave)
COMMUNICATION NETWORKS
(2008 Course) (Semester - I) (Elective - I) (504224)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain network design issues briefly. **[4]**

b) Explain the structure of Network design tool. **[4]**

c) Explain centralized data networks & Distributed data networks. **[6]**

d) Classify the different routing algorithms. **[2]**

Q2) a) Explain any one wireless network with their standards and specifications. **[4]**

b) Explain different Network devices briefly. **[4]**

c) Explain Network functions briefly. **[4]**

d) A Messages independently arrive to a system at the rate of 10 per minute. Their lengths are exponentially distributed with an average of 3600 characters. They are transmitted on a 9600bps channel. A character is 8 bits long. **[4]**

Calculate:

i) Average service time Ts.

ii) What is arrival rate A.

iii) What is Service rate D

iv) What is utilization of server U.

P.T.O.

Q3) a) Compare Frame Relay with X.25 network. **[4]**

b) Why small and fixed size cells are used in ATM networks? **[4]**

c) Compare virtual circuit packet switching with circuit switching. **[4]**

d) Explain packet switching and related delays with proper timing diagram. **[4]**

Q4) Write short note on any three. **[18]**

a) ATM layers

b) Erlang-B function

c) MAC layer of IEEE-802.11 standard

d) TCP header

SECTION - II

Q5) a) Explain the TCP/IP application layer protocols briefly. **[4]**

b) Explain necessity of Fragmentation in IP networks. **[4]**

c) Explain Link state routing in detail. **[4]**

d) Explain stored Audio/Video multimedia communication. **[4]**

Q6) a) 24 terminals share a 9600 bps line. Each terminal sends an average of 10 msg/min over the line. The message lengths are exponentially distributed with an average length of 2000 bits. **[4]**

Calculate:

i) Average time that a message spends in system Ts

ii) What is arrival rate A

iii) Total time in the system T

iv) What is utilization of server U.

b) Write a short note on H.323 architecture. **[4]**

c) What is MTU? List the different MTUs for different networks. **[4]**

d) What is RTSP over UDP? Explain with practical Internet application. **[4]**

Q7) a) Explain RSA algorithm briefly. **[4]**

b) We are given three system. All have 50% utilizations. All have average message lengths of 1400 bits. The first has exponentially distributed message lengths. The second has constant 1400 bits message length. In the third, half the messages are 400 bits long and the other half are 2400 bits long. **[4]**

Calculate

i) What is arrival rate A

ii) The mean service time E(S)

iii) The waiting time Tw for first case

iv) The waiting time Tw for second case

c) Explain the CSMA/CD frame format in detail. **[4]**

d) Explain Multicast and Unicast networks briefly. **[4]**

Q8) Write short note on any three: **[18]**

a) Video conferencing.

b) Network security.

c) PGP and S/MIME.

d) Proxy server as Firewall.

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Total No. of Questions : 8]

SEAT No. :

P3273

[Total No. of Pages : 2

[4660] - 287
M.E (E & TC) (Microwave)
a - SMART ANTENNAS
(2008 Course) (Elective - II) (504225)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Give and explain the Block diagram of a narrow-band adaptive antenna system. **[8]**

b) Explain the Concept of overlaying. **[8]**

Q2) a) Discuss Cell Splitting as well as Cell Sectorization. **[8]**

b) Draw and explain Broad-band beam-former structure using TDL filter. **[8]**

Q3) a) What do you mean by Digital beam-forming process? What is the effect of sampling on digital beam forming? **[8]**

b) Compare and contrast LMS and RLS Algorithms. **[9]**

Q4) a) Which are the DOA Estimation methods? Explain any one of them in detail. **[9]**

b) Draw and explain Two-element delay-and-sum beam-former structure. **[8]**

P.T.O.

SECTION - II

Q5) a) Compare the Smart antenna system with Conventional antenna system. **[8]**

b) How Spatial Processing is beneficial for smart antenna system? Explain. **[8]**

Q6) a) Explain Space Time Rake Receiver for CDMA. **[8]**

b) Explain Single User Space Time Rake Receiver with diagram. **[8]**

Q7) a) Compare and contrast Non-coherent and Coherent CDMA spatial processors. **[9]**

b) How range and capacity of CDMA can be improved using Spatial Filtering. **[8]**

Q8) a) Describe the Reverse Channel Spatial Filtering with respect to WLL subscriber unit. **[9]**

b) Mention the application of Smart antennas. **[8]**

Total No. of Questions : 10]

SEAT No. :

P2702

[Total No. of Pages : 2

[4660] - 288
M.E. (E & TC) (Micro wave)
b- SPEECH PROCESSING AND APPLICATIONS
(2008 Course) (Semester - I) (Elective - II) (504225)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Questions 5 and 10 are compulsory.***
2) ***Solve any three questions from remaining questions of each Section.***
3) ***Right side figures indicate marks.***
4) ***Assume data necessary.***

SECTION - I

Q1) a) Explain speech production mechanism with its engineering analogy? **[8]**

b) Explain the characteristic properties of speech signal? What are the challenges for the researchers working in this area? **[8]**

Q2) a) What are the speech digitization techniques? **[4]**

b) What is speech coding? **[3]**

c) Explain any two of the speech coding technique of the following PCM/ DPCM/ADPCM/Sub band coding? **[9]**

Q3) a) How the speech feature extraction techniques are classified? What is significance of speech preprocessing. **[8]**

b) Explain with suitable diagram Mel Frequency Cepstral coefficient (MFCC) of feature extraction? **[8]**

Q4) a) What is speech recognition? How it is classified? Explain in brief Steps involved in speech recognition systems? **[8]**

b) Explain LPC technique with neat block diagram? **[8]**

P.T.O.

Q5) Write short note on. **[18]**

a) Filter Bank Processing of speech signal.

b) Spectrum distance measures in speech recognition.

c) Auditory Measures for speech recognition.

SECTION - II

Q6) a) Explain Hidden Markov Model for speech recognition? **[8]**

b) Explain Neural network approach in speech recognition? **[8]**

Q7) a) i) What is Speaker recognition?

ii) How it is Classified?

iii) What are the Issues in speaker recognition systems.

[10]

b) What are the applications of speech recognition and speaker recognition systems? **[6]**

Q8) a) Explain with block diagram text to speech conversion processes. **[8]**

b) How will you comment on feature extraction techniques for speech and speaker recognition? Why some of the techniques are common for both? **[8]**

Q9) a) Explain Dynamic Programming based speech recognition algorithm? **[8]**

b) What are the measures of synthesized speech output performance. **[8]**

Q10) Write a short note on **[18]**

a) Voice processing hardware and software?

b) What is adaptive echo cancellation for speech signal?

c) Explain any one speech enhancement technique.

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Total No. of Questions : 8]

SEAT No. :

P3327

[Total No. of Pages : 2

[4660]-289
M.E. (E & T/C) (Microwave)
SEMICONDUCTOR DEVICES MODELING & TECHNOLOGY (Elective - II)
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is equilibrium condition of pn diode? Explore w.r.t. neat schematic. **[8]**

b) With suitable schematic diagrams, explain fabrication process of pn diode. **[8]**

Q2) a) What are the limitations of bipolar junction transistor at high frequency? Which parameters are responsible for it? Explain in detail with necessary analysis. **[8]**

b) Explain secondary effects in bipolar junction transistor. **[8]**

Q3) a) What are the capacitances involved in MOSFET? What is effect of surface? **[8]**

b) Explain various current-voltage characteristics of MOSFET. **[8]**

P.T.O.

Q4) Write short notes on any three : **[18]**

a) Generalized biasing and switching characteristics of transistor.

b) Reverse breakdown of diode.

c) High frequency and high speed issues of field effect transistor / MOSFET.

d) Transient and ac behaviour of pn diode.

SECTION - II

Q5) a) Explore SPICE model of BJT in detail. **[8]**

b) List various SPICE parameters of any one semiconductor device. Elaborate each in short. **[8]**

Q6) a) What is latch up in CMOS Inverter? Explain in detail. **[8]**

b) Explore Bi-CMOS fabrication process. **[8]**

Q7) a) What is meant by integration density? What is Moore's law? How the scaling of MOSFET has happened progressively? **[8]**

b) Explain fabrication process of CMOS. **[8]**

Q8) Write short notes on any three : **[18]**

a) MOSFET layout design rules

b) MOSFET threshold voltage

c) Bi-CMOS inverter

d) Saturation region of MOSFET

Total No. of Questions : 6]

SEAT No. :

P2703

[Total No. of Pages : 2

[4660] - 290
M.E. (E & TC) (Microwave)
MICROWAVE INTEGRATED CIRCUITS
(2008 Pattern) (Semester - II) (504228)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any <u>TWO</u> questions from each section.***
2) ***Use of elemental value chart is permitted.***
3) ***Figure to right indicates full marks.***
4) ***Assume suitable data whenever necessary.***

SECTION - I

Q1) a) Explain Richard's transformation of Kuroda's four identities in detail for implementation of filters. **[10]**

b) Design low pass composit filter with cutoff frequency 2.5 MHz and impedance of $75\,\Omega$. Place infinite attenuation pole at 2.508 MHz and plot the frequency response from 0 to 4.5 MHz. **[15]**

Q2) a) Draw commonly use types of planner transmission lines for MIC and explain attenuation in micro - strip lines. **[15]**

b) Design a Bethe hole coupler for X band waveguide operating at 9GHz with coupling of 20dB. Calculate & plot coupling and Directivity from 7 to 11 GHz. Assume round aberture. The constant values are as given:

$a = 0.02286$ m, $b = 0.01016$m, $\lambda_0 = 0.0333$m, $k_0 = 188.5\ m^{-1}$, $\beta = 129.0\ m^{-1}$, $z_{10} = 550.9\,\Omega$, $p_{10} = 4.22 \times 10^{-7}\ m^2/\Omega$. **[10]**

Q3) a) Explain PIN Diode as MIC component in detail. **[12]**

b) Calculate the width & length of microstrip line of $50\,\Omega$ characteristic impedance and 90^o phase - shift at 2.5 GHz. The substract thickness is- d = 0.127 cm with $\in_r = 2.20$. **[13]**

P.T.O.

SECTION - II

Q4) a) Explain network matrix decomposition method for MIC synthesis. **[15]**

b) Design a transistor oscillator at 4GHz using a GaAs FET in common gate configuration, with 5nH inductor in series with the gate to increase the instability. Choose a terminating network to match to $50\,\Omega$ load and appropriate tuning network. The 's' parameter for the transistor are $z_0 = 50\,\Omega$, $s_{11} = 0.72 \angle -116^o$, $s_{21} = 2.6 \angle 76^o$, $s_{12} = 0.03 \angle 57^o$, $s_{22} = 0.73 \angle -54^o$. **[10]**

Q5) a) Discuss in detail reflection type phase shifter. **[10]**

b) A 12-24 GHz frequency multiplier is designed using FET with the following parameters. $V_t = -2.0V$, $R_i = 10\,\Omega$, $G_{gs} = 0.20$ pF, $C_{ds} = 0.15$ pF, $R_{ds} = 40\,\Omega$. The operating point of transistor is $V_{g\,max} = 0.2V$, $V_{g\,min} = -6.0$ V, $V_{d\,max} = 5.0V$, $V_{d\,min} = 1.0$ V and $I_{max} = 80$mA. Find conversion gain of multiplier. **[15]**

Q6) a) Discuss applications of MIC to **[16]**

i) Radar

ii) Satellite communication

iii) Radio system

iv) Broadcast system

b) Explain noise measurement technique for MIC. **[9]**

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Total No. of Questions : 8]

SEAT No. :

P2704

[Total No. of Pages : 2

[4660] - 291

M.E. (E & TC) (Microwave)

SIGNAL PROCESSING FOR WIRELESS COMMUNICATION

(2008 Pattern) (Semester - II) (504229)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain what is distribution function and density function. Explain any four characteristics of distribution and density function. **[8]**

b) Explain hypothesis testing. Explain null and alternate hypothesis. **[4]**

c) Explain Gaussian distribution and uniform distribution along with its characteristic equation and application. **[4]**

Q2) a) Explain the concept of adaptive filter. Explain the main components of adaptive filter. Explain how adaptive filters can be used for noise cancellation. **[8]**

b) Derive the Wiener Hopf equation. Show the error surface curve of Wiener filter and explain its characteristics. **[8]**

Q3) a) Explain the matched filter approach by maximizing SNR. **[8]**

b) When the Zero hypothesis is true, a DC value of zero is transmitted. When one hypothesis is true, a DC Value of 0.75 is transmitted. The transmitted signal is embedded in uniformly distributed noise. The variance of uniform noise is 0.75. Assume each event is equally likely, the cost of making no error is zero and the cost of making either one of the possible mistakes is unity. Only single sample is available.

P.T.O.

i) Determine the optical detector and state which criterion you are using.

ii) Derive the appropriate threshold.

iii) Compute the total probability of error.

[8]

Q4) a) What is white Gaussian noise? Draw and explain its characteristic. **[6]**

b) Draw the structure of correlation receiver for binary detection problem and derive the expression for threshold. **[12]**

SECTION- II

Q5) a) Explain and analyse the performance of optimum receiver used for on off Keying. **[8]**

b) Explain the basic concept of inter symbol interference and adaptive equalization. **[8]**

Q6) a) Explain the term power spectral density. **[4]**

b) Explain any one method of parametric and non parametric power spectrum estimation. **[12]**

Q7) a) Explain the receiver structure for known signals embedded in colored noise. **[8]**

b) Explain spread spectrum communication in detail. **[8]**

Q8) Write short notes on any three: **[18]**

a) Radar target models.

b) System modelling using adaptive filters.

c) RLs algorithm.

d) Maximum Likelihood criteria.

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Total No. of Questions : 8]

SEAT No. :

P2705

[Total No. of Pages : 3

[4660] - 292
M.E. (E & TC) (Microwave)
MOBILE COMMUNICATION - GSM AND CDMA
(2008 Pattern) (Semester - II) (504230)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) State the features of frequency division multiple access (FDMA). Explain non linear effects in FDMA. Compare FDMA and TDMA. **[8]**

b) A normal GSM has 3 start bits, 3 stop bits (also called as trailing bits), 26 training bits for allowing adaptive equalization. 8.25 guard bits and 2 burst of 58 bits of encrypted data which is transmitted at 270.833 kbps in the channel. **[10]**

Find

i) Number of overhead bits per frame, b_{oh}

ii) Total number of bits/frame

iii) Frame rate

iv) Time duration of a slot

v) Frame efficiency

Q2) a) Explain the following in brief. **[8]**

i) Cell sectoring

ii) Microcell zone concept

P.T.O.

b) Explain GMSK modulation technique. **[8]**

Q3) a) Explain the following terms. **[8]**

i) Traffic measurement units

ii) Grade of service

iii) Blocking probability

iv) Traffic usage

b) With the help of neat diagram explain the architecture of GSM. **[8]**

Q4) a) Explain the following terms in Cellular communication. **[8]**

i) Adjacent channel interference

ii) Co-Channel interference

b) Draw neatly GSM frame structure and explain. **[8]**

SECTION - II

Q5) a) Explain GSM operations from transmitter to receiver with the help of neat block diagram. **[8]**

b) Explain the entire process involving use of traffic and control channel when a call is initiated by mobile in GSM. **[8]**

Q6) a) Explain the following terms with reference to CDMA. **[8]**

i) Power control

ii) Soft hand off

b) Explain reverse IS-95 channel modulation process with neat diagram. **[8]**

Q7) a) Explain Frequency Hopped spread spectrum modulation with neat block diagram. **[8]**

b) Explain the necessity of Equalization, diversity and channel coding in wireless communication systems. Give the classification of Equalizers. **[8]**

Q8) Write a note on the following: **[18]**

a) GPRS

b) RAKE receiver

c) OFDM

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Total No. of Questions : 8]

SEAT No. :

P2706

[Total No. of Pages : 2

[4660] - 293
M.E. (E & TC) (Microwave)
a- FIBER OPTIC COMMUNICATION
(2008 Pattern) (Semester - II) (Elective - III) (504231)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in seperate books.***
3) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) The refractive index and the photoelastic co-efficient for silica are 1.52 and 0.287 respectively. The silica has an estimated isothermal compressibility of 6×10^{-11} m^2 per Newton at 1400 K Temperature. Boltzman constant is 1.381 $\times10^{-23}$ Joules per Kelvin. Determine the Theoretical attenuation in desible per kilometer due to the Fundamental Rayleigh scattering in silica at optical wavelength of 0.65 micro meter, 1.02 micrometer and 1.28 micrometer. **[8]**

b) What are the different materials and dopants used for Fabrication of glass Fiber with various refractive index. Explain the Double crucible method of fiber manufacturing with neat diagram. **[8]**

Q2) a) What are the different types of splicing techniques? Explain difference between the connectors and splices. **[6]**

b) Explain the marking of OTDR in optical fiber communication. **[6]**

c) Write short note on Erbium-Doped fiber amplifier. **[6]**

Q3) a) Explain the advantages and disadvantages of fiber optic communication over wired communication. **[6]**

b) Explain signal propagation in graded index fiber with wave guide equations. **[5]**

c) Explain the pulse spreading and its significance in communication. **[5]**

P.T.O.

Q4) a) An Optical link consist of multimode step index fiber with a core refractive index of 1.4 and relative refractive index difference of 1.1%. The length of fiber is 6.5km.

Calculate:

i) The rms pulse broadening due to intermodal dispersion on the link. **[3]**

ii) The Delay difference between the slowest and fastest mode at the fiber output. **[3]**

iii) The Bandwidth X length product. **[4]**

b) Explain the Fusion splicing of optical fiber with neat diagram. **[6]**

SECTION - II

Q5) a) Write short note on any two. **[10]**

i) Wavelength Division multiplexing.

ii) Bit Error Rate.

iii) Attenuation in optical fiber.

b) Explain the working of optical receiver with neat diagram. **[8]**

Q6) a) Explain star coupler. Obtain 8×8 star coupler using 2×2 coupler. **[8]**

b) Explain the concept of Tunable sources and tunable filters in OFC. **[8]**

Q7) a) Estimate the total insertion loss of a fiber joint with lateral misalignment of 1.1 micrometer and angular misalignment of 1^{o}. The parameter of the single mode fiber are **[8]**

i) Numerical aperature (NA) = 0.1

ii) Core diameter (2a) = 8 micrometer

iii) Normalized frequency (ν) = 2.4

iv) Refractive index of core (n_1) = 1.46.

b) Draw optical power loss model for point to point link. Explain link power budget with suitable example. **[8]**

Q8) a) Calculate the incident optical power necessary to achieve an SNR of 50dB at the receiver for the analog optical fiber system operating at wave length of one micrometer which has a post detection bandwidth of 5MHz. **[8]**

b) Explain SONET/SDH networks with neat diagrams. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P2707

[Total No. of Pages : 2

[4660] - 295
M.E. (E & TC) (Microwave)
c: EMI & EMC TECHNIQUES
(2008 Pattern) (Semester - II) (Elective - III) (504231)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Derive the equation for voltage and current by solving Helmoltz equation for a transmission line. **[10]**

b) Explain Uncertainty and Confidence in measurements. **[8]**

Q2) a) Explain Power ratio method and Voltage ratio method of attenuation measurement. **[10]**

b) Discuss important considerations when making attenuation measurements. **[6]**

Q3) a) Discuss principle of automated noise measurements. **[8]**

b) Derive the expression for Noise Figure for two port network. **[8]**

Q4) Write notes on following RF voltage measuring instruments: **[16]**

a) RF millli Volt meter,

b) Wide band AC Volt meter,

c) Oscilloscopes.

P.T.O.

SECTION - II

Q5) a) Explain with block schematic, the working of Spectrum Analyser. Discuss it's applications. **[10]**

b) Discuss RFIC and MMIC measurement. **[8]**

Q6) a) Explain the principle of operation of Network analyzer. **[10]**

b) Explain the significance of vector measurements. **[6]**

Q7) a) Discuss the different RF power sensing devices. Explain the thermocouple power sensor in detail. **[10]**

b) Discuss the types of noise and noise sources. **[6]**

Q8) Write notes on: **[16]**

a) Power coupler and Reflectometer,

b) RF Power measurements and calibration,

c) Noise figure Analyzer.

☼ ☼ ☼

Total No. of Questions : 6]

SEAT No. :

P3484

[Total No. of Pages :2

[4660]-298
M.E. (E & TC) (Microwave)
SOFTWARE PROJECT MANAGEMENT
(2008 Pattern) (Elective - IV)

Time : 3 Hours] *[Maximum Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Attempt any TWO questions from each Section.***
3) ***Neat diagrams, Flow charts must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Write short notes on any Two

i) Software Testing **[6]**

ii) Configuration Management **[6]**

iii) CMM Process Framework **[6]**

b) What is a Function point? Explain Function Point analysis with the help of a new web site development example for a bank. **[13]**

Q2) a) What is a project? Enlist and explain in detail the characteristics associated with project. **[6]**

b) What is Management? Enlist and explain in detail the functions associated with Management. **[6]**

c) Explain different project Management activities **[13]**

Q3) a) Explain the procedure for calculating critical path in a software project. **[6]**

b) What is strategy? How a strategy is finalized for various activities in software project? **[6]**

c) What is an estimate? What are the different ways of estimating the size of software project? How to make an estimate more realistic? **[13]**

P.T.O.

SECTION - II

Q4) a) Define software quality. What is the importance of software quality? **[6]**

b) What are different software quality measures? Give a suitable example for each type. **[6]**

c) Explain Trade-off Triangle with the help of a GUI example. **[13]**

Q5) a) Explain risk analysis and its management in a software project. **[6]**

b) What is SDLC? What are different SDLC models? **[6]**

c) What is an 'Organizational Structure'? What are different types of organizational structures and which one of these is suited for software project and why? **[13]**

Q6) a) Why reviews are important in a software project? How to improve the project performance by reviews? **[6]**

b) Explain exploratory program development style and state drawbacks of the this style. **[6]**

c) What are advantages and disadvantages of using Services and goods from outside the organization? What are different types of contracts? Give a suitable example for each type. **[13]**

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Total No. of Questions : 8]

SEAT No. :

P3328

[Total No. of Pages : 2

[4660]-300
M.E. (E & TC) (VLSI & Embedded Systems)
ANALOG AND DIGITAL CMOS IC DESIGN
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Calculate W/L for MOSFET to offer dynamic resistance of 10 kΩ. Assume suitable data. **[8]**

b) With the help of necessary schematic explain current sink & source with Rout offered. **[8]**

Q2) Design current mirror for 100 micro A. Assume suitable data. What are the techniques to improve output resistance? Give mathematical analysis to support. **[16]**

Q3) a) What are the performance parameters of voltage reference circuit? Explore in brief. What is state of art? **[8]**

b) What is mean by buffered op-amp? Explore with the schematic? **[8]**

Q4) Write short notes on any three: **[18]**

a) Cascode amplifier

b) Macro model of op-amp

c) BGR

d) Output amplifiers

P.T.O.

SECTION - II

Q5) a) Explain with suitable example sources of static and dynamic hazards. How to eliminate static hazards? **[8]**

b) What is static and dynamic power dissipations? Derive an expression for Power Delay Product (PDP) and Energy Delay Product (EDP). **[8]**

Q6) a) What is metastability problem in digital design? How to overcome metastability? **[8]**

b) Explain domino logic in detail. **[8]**

Q7) a) Compare synchronous and asynchronous machines. **[4]**

b) Draw state diagram, write a VHDL code and test bench for 1101 Moore sequence Detector. **[12]**

Q8) Write short notes on any three: **[18]**

a) Transmission Gate: Merits, Demerits and Use.

b) Technology Scaling

c) λ Parameter and DRC

d) NORA Logic.

e) Stick Diagram and CMOS Layout

Total No. of Questions : 8]

SEAT No. :

P2782

[Total No. of Pages :2

[4660] - 302
M.E (E & TC) (VLSI and Embedded Systems)
EMBEDDED SYSTEM DESIGN
(2008 Course) (504183) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Discuss various design metrics considered in an embedded system design. **[8]**

b) What are the design methodologies adopted in embedded system design. Give an example. **[8]**

Q2) a) Mention the different IC technologies. **[8]**
Explain any one technique in detail.

b) Draw giving major blocks, the architecture of a general purpose processor. **[8]**

Q3) a) Compare RISC and CISC. **[8]**

b) Compare programming techniques in FPGA and CPLD. **[8]**

Q4) Write notes on: **[18]**

a) System on chip

b) Market window

c) Cachc memory

P.T.O.

SECTION - II

Q5) a) Draw the architecture of ARM 7 processor with the help of a neat diagram and explain main blocks. **[8]**

b) Compare AR7 and ARM 9. **[8]**

Q6) a) Comment on signal integrity in interconnection. **[8]**

b) How the functional verification is done in embedded system? Give an example. **[8]**

Q7) a) What are the parameters for optimization techniques? Explain any 2 parametric optimization techniques. **[8]**

b) What is built-in self test? Explain. **[8]**

Q8) Write notes on: **[18]**

a) Boundary scan.

b) CAN bus.

c) I2C.

Total No. of Questions : 8]

SEAT No. :

P2783

[Total No. of Pages :2

[4660] - 303
M.E. (E & TC) (VLSI and Embedded System)
a - ASIC DESIGN AND MODELLING
(2008 Course) (Elective - I) (504184) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Question no.1 and Question no. 8 are compulsory.***
2) ***Answer any two questions from remaining questions from each Section.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of electronic calculator is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the step by step process of ASIC design in detail. Brief about the various EDA tools that are used for this process. **[12]**

b) Describe the various issues in verification. **[6]**

Q2) a) Design the smart Engineering building lift controller such that: **[8]**

Input : in _button (10 downto 0), position_sensor (15 downto 0)

Outputs: up_down, stop_go, door_open_close, display (10 downto 0)

Additional input/outputs: over_weight, beep

How many states, processes do you need?

Draw the state transition diagram.

Write VHDL code.

b) Describe the various verification issues. **[8]**

Q3) a) Compare the hardware design verification and software design verification. **[8]**

b) Draw the stick diagram for 2 inputs AND gate. Calculate area needed on chip. **[8]**

P.T.O.

Q4) a) What do you mean by clock skew? How it can be rectified? Explain it with neat waveforms. **[8]**

b) List different DFT techniques and explain in detail with example.

memory BIST Insertion Technique. **[8]**

SECTION - II

Q5) a) What are the goals of placement and explain the Eigen value algorithm for placement? **[10]**

b) What are the objectives of system portioning and explain in detail the group migration algorithm in for system partitioning. **[6]**

Q6) a) Explain static timing analysis in detail. **[8]**

b) Explain the K-L algorithm in detail. **[8]**

Q7) a) What are various issues in analog mixed signal design? **[8]**

b) Explain the various routing techniques. Explain any one of them in detail. **[8]**

Q8) Write short note on: **[18]**

a) Power dissipation.

b) Post layout synthesis.

c) Automatic test pattern generator [ATPG].

Total No. of Questions : 8]

SEAT No. :

P2784

[Total No. of Pages :2

[4660] - 304
M.E (E & TC) (VLSI and Embeded System)
(b) NANOTECHNOLOGY
(2008 Course) (Elective - I) (Semester - I) (504184)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any three questions from each Section.***
3) ***Neat diagrams must be drawn wherever necessry.***
4) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Justify 'nanotechnology will change the world in next few years'. **[8]**

b) Explain "Fundamental Science behind Nanotechnology". **[8]**

Q2) a) Explain Molecular Recognition w.r.t. nanoscience. **[8]**

b) 'Biosystems is nothing but complex nanosystems', justify the statement. **[8]**

Q3) a) What is the role of molecular recognition in nanotechnology? **[8]**

b) Explain optical properties at nanoscale. **[8]**

Q4) a) What is smart material and sensors? **[9]**

b) Explain the concept of "Electronic nose". **[9]**

SECTION - II

Q5) a) Explain different structures of carbon nanotubes. **[8]**

b) Discuss electrical and mechanical properties of CNT. **[8]**

P.T.O.

Q6) a) Write differences between MEMS and NAMS. **[8]**

b) Explain Bio-medical applications of nano-electronics. **[8]**

Q7) a) Explain e-beam lithography. **[8]**

b) Explain atomic beam lithography. **[8]**

Q8) Explain the working principle of following (any three) **[18]**

a) Scanning Probe Instruments.

b) Magnetic Force Microscopy (MFM).

c) Spectroscopy.

d) Electrochemistry.

e) Electron Microscope.

Total No. of Questions : 8]

SEAT No. :

P2785

[Total No. of Pages :2

[4660] - 305
M.E (E & TC) (VLSI and Embedded Systems)
c : MACHINE INTELLIGENCE
(2008 Course) (Semester - I) (Revised Course) (Elective - I) (504184)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) What is fuzzy resoning? With suitable example discuss Mamdani fuzzy inference system. **[8]**

b) Discuss in detail the composition of fuzzy relation. Explain Max-min composition and Max product composition. **[8]**

Q2) a) What are the problems occurring in determining the mathematical model for an unknown system by observing input-output data pairs? How the parameter identification is being carried out in system identification. **[8]**

b) Draw the block diagram for the inverse learning method Explain in detail the training and application phase of the ANFIS Controller. **[8]**

Q3) a) What are the different issues concerned with fuzzy inference system. **[8]**

b) What is fuzzy resoning? Discuss in detail the fuzzy resoning for multiple rules with multiple antecedents. **[8]**

Q4) Write a Short Note on (Any three): **[18]**

a) Dynamic Programming.

b) Sugeno fuzzy model.

c) Neuro Fuzzy Control.

d) Use of Genetic Algorithm in Game Playing.

P.T.O.

SECTION - II

Q5) a) List the applications of Neural Network in image Processing and explain any one application in detail with block schematic. **[8]**

b) What is radial basis function network? What are the different architecture and learning methods of radial basis function network. **[8]**

Q6) a) What do you mean by derivative based optimization? Describe in detail any one gradient based method. **[8]**

b) What are the different clustering algorithm? Explain K - mean clustering algorithm in detail. **[8]**

Q7) a) What is unsupervised learning? Write a short note on competitive learning. **[8]**

b) What is ADLINE networks? Explain ADLINE training algorithm. **[8]**

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

a) Continuous and Binary Hopfield Network.

b) Principal Component Analysis.

c) Feedback Control System using in ANN.

d) Kohonen self organizing network.

Total No. of Questions : 8]

SEAT No. :

P3477

[Total No. of Pages : 2

[4660] - 306

M.E. (E & TC) (VLSI & EMbedded System)

RECONFIGURABLE COMPUTING

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Why is configurable ALU said very close to reconfigurable device? Explain with suitable schematic. **[8]**

b) What are the limitations of General Purpose Processor? Why evolution in it is necessary? What are the characteristics of ideal reconfigurable device? **[8]**

Q2) a) Give the growth equation for wire, channel and associated hardware in reconfigurable device design. **[8]**

b) What is Rents rule? How will you apply it in design of your own reconfigurable device? **[8]**

Q3) a) Why is multiplier considered as a test operation? Compare different architectures based on their performances for multiplication. **[8]**

b) What is meant by configurable, programmable and fixed function devices? Give suitable examples. **[8]**

P.T.O.

Q4) Write short notes on any three : **[18]**

a) Fixed function devices.

b) Multi context FPGA.

c) Vector Processor.

d) LUT Mapping.

SECTION - II

Q5) a) Which method of instruction will you suggest for reconfigurable device? Why? Draw the schematic in detail to explore. **[8]**

b) Explain the concept of peak performance density in RP space area model. **[8]**

Q6) a) What is context? Why are contexts important in reconfigurable devices? **[8]**

b) Why is excess stress being given on optimization of interconnects? What are challenges in it? **[8]**

Q7) With the help of detail block diagram. Explain the architecture of DPGA. List its features, merits and limitations. **[16]**

Q8) Write short notes on any three : **[18]**

a) MATRIX.

b) Fine-grained and Coarse-grained structure.

c) Temporal Partitioning algorithm.

d) Interconnect hierarchy.

Total No. of Questions : 10]

SEAT No. :

P2786

[Total No. of Pages :2

[4660] - 307
M.E. (E & TC) (VLSI and Embedded Systems)
b - MEMORY TECHNOLOGIES
(2008 Pattern) (Elective - II) (504185) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What is non-volatile semiconductor memory? Give the classification of non-volatile memory. **[8]**

b) Explain the following application specific SRAMS. **[10]**

i) Line Buffers ii) CAM

Q2) a) Draw the DRAM 3T cell structure and explain its operation. **[8]**

b) Enlist the advantages and disadvantages of trench capacitor based cells. Compare SPT and TTC trench capacitors. **[8]**

Q3) a) Compare Bipolar PROM and CMOS PROM. **[8]**

b) Explain in detail FLOTOX (Floating Gate Tunneling Oxide Technology) with the help of schematic and energy band diagram. **[8]**

Q4) a) What is pattern sensitive fault? What are the categories of neighborhood pattern sensitive faults (NPSF). **[8]**

b) Explain March Test Algorithm? What types of fault it covers and explain in brief. **[8]**

P.T.O.

Q5) Write short notes on:

a) Significance of testing of semiconductor memory. **[6]**

b) Explain Single stuck fault model (SSF). **[6]**

c) IDDQ fault modeling. **[4]**

SECTION - II

Q6) a) Explain in detail the general design for testability techniques? **[8]**

b) Compare reliability of DRAM capacitors for trench and stacked capacitors? **[8]**

Q7) a) Explain Analog memory and enumerate applications of Analog memory. **[8]**

b) Compare FRAM, MRAM, SRAM and DRAM. **[8]**

Q8) Write short notes on **[18]**

a) SEU (Single Event Upset) hardening.

b) Packages for SMT (Surface Mounting Technology).

c) Reliability issues related to semi conductor memory.

Q9) a) Explain in detail memory failure mechanisms with the help of bathtub curve. **[8]**

b) What are memory cards? Explain Flash memory card. **[8]**

Q10) Write short notes on

a) Digital Tablet PC. **[6]**

b) VCOS technology (VLSI chip on Silicon) **[6]**

c) Single Electron memory. **[4]**

Total No. of Questions : 10]

SEAT No. :

P3274

[Total No. of Pages : 2

[4660] - 308
M.E. (E & TC) (VLSI & Embedded Systems)
VLSI EDA TOOLS
(2008 Pattern) (Elective - II (c)) (504185) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain Gate array based ASICs and Explain post layout simulation. **[9]**

b) Explain intellectual property core and cross compiler. **[9]**

Q2) a) Explain synthesis of Viterbi decoder. **[8]**

b) Explain the use of stick diagram for designing the logic circuit at layout level with a suitable example. **[8]**

Q3) a) Explain how the wire load tables are used to measure delays in floor planning. **[8]**

b) What are the factors contribute to best floor planning? Explain in detail. **[8]**

Q4) a) What are different approaches to global routing? Explain in detail one algorithm to find the shortest path. **[8]**

b) What do you mean by clock skew? How it can be rectified. **[8]**

P.T.O.

Q5) a) Write the expressions for the various power dissipation to be considered for the clock planning in ASIC. **[8]**

b) Compare design rule checking, electrical rule checking and schematic rule checking processes. **[8]**

SECTION - II

Q6) a) Explain the mechanism for event scheduling during the simulation of logic circuits used by VHDL Simulator like modelsim. **[8]**

b) What are different simulation modes in simulator? Explain in detail timing analysis . **[8]**

Q7) a) Explain various routing techniques. Explain any one of them in detail. **[8]**

b) How to calculate sub threshold leakage current of comparator in micro wind 3.1 at layout level. **[8]**

Q8) a) Explain ADL and STF files of Actel in detail. **[8]**

b) List the different EDA tools used for ASIC Design. **[8]**

Q9) Explain the design flow for Cadens custom IC design. What is process design kit? **[16]**

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

a) Micro wind tool.

b) Boole Dozer.

c) Delay Model.

Total No. of Questions : 8]

SEAT No. :

P3329

[Total No. of Pages : 2

[4660] - 309
M.E. (E & TC) (VLSI & Embedded Systems)
REAL TIME OPERATING SYSTEMS
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain different software development tools are used in Embedded System Design? **[10]**

b) Explain importance of RTOS over the general OS with example. **[8]**

Q2) a) What is dead locks? Explain the method to overcome dead locks problems with example. **[10]**

b) Explain how interrupts handle the critical section of process. **[6]**

Q3) a) What is importance of priority in process management? How priority inversion is avoided. **[10]**

b) Explain task states & its transitions with suitable diagram. **[6]**

Q4) a) What is Role of MMU in memory management? Explain in details. **[8]**

b) What is process? Explain defferent scheduling algorithm of process. **[8]**

P.T.O.

SECTION - II

Q5) a) What is Semaphore? Explain the concept of Semaphore in details with suitable example. **[8]**

b) Explain the different features of μ COS operating system. **[8]**

Q6) a) Explain how inter task communication is carried in μ COS OS. **[10]**

b) What is POSIX threads? Explain in details. **[8]**

Q7) a) What are the features of linux kernel. **[8]**

b) What is mean by porting of OS? Explain how μ COS is ported? **[8]**

Q8) Write short notes on : **[16]**

a) Mail box.

b) Pipes & filter.

c) Client-Server model.

d) Mutex.

Total No. of Questions : 8]

SEAT No. :

P2787

[Total No. of Pages :2

[4660] - 310
M.E (E & TC) (VLSI and Embedded System)
EMBEDDED SIGNAL PROCESSING
(2008 Course) (Semester - II) (504189)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Design a Butterworth filter using the impulse invariance method for the following specifications. **[6]**

$0.8 \leq H(e^{jw})) \leq 1$ $\quad 0 \leq W \leq 0.2 \leq 0.2\pi$

$H(e^{jw}) \leq 0.2$ $\quad 0.6\pi \leq W \leq \pi$

b) Draw the complete Signal flow graph in all respect for 08 point DITFFT. **[4]**

c) Find IDFT of given sequence **[6]**

i) X(K) = [10, –2.0 + 2.0i, –2.0, –2.0–2.0i]

ii) X(K) = [0 0 2 0]

Q2) a) What is DCT? Explain in detail different properties of DCT? **[8]**

b) Give difference between **[8]**

i) FIR and IIR filter

ii) Recursive and Non recursive realization of filter

Q3) a) Define retiming? Explain different retiming techniques? **[6]**

b) What is DWT? Whether DWT is better than DFT? Explain. **[6]**

c) What is correlation? Compute cross correlation of following sequences **[4]**

X(n) = [0,0,2,–1,3,7,1,2,–3,0,0], y(n) = [0,0,1,–1,2,–2,41,-2,5,0 0 ...]

P.T.O.

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

a) Folding

b) Convolution

c) STFT

d) Iteration Bound

SECTION - II

Q5) a) With reference to DSP processor explain the following **[8]**

i) Pipelining

ii) hardware multiplier accumulator

iii) Special Instruction

b) Draw and explain the architecture of blackfin processor. **[8]**

Q6) a) Explain the adaptive noise cancellation with LMS adaptive algorithm? **[8]**

b) With the help of block diagram explain architecture of TMS 320C67 XX processor? **[8]**

Q7) a) Explain the data addressing capabilities in signal processing devices. **[8]**

b) Explain the computational accuracy wrt to **[8]**

i) Dynamic range and Precision.

ii) A/D conversion error

iii) Source of error in DSP implementation

iv) DSP computational error

Q8) Write short notes on (any three): **[18]**

a) DTMF generation and detection

b) Wavelet transform

c) FFT algorithm

d) VLIW architecture

Total No. of Questions : 8]

SEAT No. :

P2788

[Total No. of Pages :2

[4660] - 311
M.E (E & TC) (VLSI and Embedded Systems)
RF IC DESIGN
(2008 Course) (504190) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What do you mean by cross talk? What are the sources of crosstalk? Explain in brief. **[8]**

b) With the help of suitable schematics, explain crosstalk mitigation techniques in brief. **[8]**

Q2) a) Design RF amplifier for the following specifications. Av = 55, Bandwidth = 200 MHz, Source Resistance = 50 Ohm, Load = 10pF and Supply Voltage = 2.5 Volt. Assume Suitable data. **[10]**

b) List Characteristics of LNA. Compare Single ended & differential LNA. **[8]**

Q3) a) Explain ASIC design flow. At what stage will you care for Cross talk? **[8]**

b) What are the Bandwidth Estimation techniques? Explore any one in detail with the help of suitable example. **[8]**

Q4) a) Describe Effects of technology scaling on RF Amplifiers. **[8]**

b) What is AM-PM Conversion? What are the solutions? **[8]**

P.T.O.

SECTION - II

Q5) a) What is substrates bias effect? Explain it with equivalent circuit model. Give the typical component values for those models. **[8]**

b) Which are the dominant parasitic to limit the bandwidth of amplifier? What are the techniques to improve? Explore one method in detail. **[8]**

Q6) a) Explain Johnson noise as applied to RF amplifiers. Give the expression of Noise Figure. Compare it with White Noise. **[8]**

b) Design cascade amplifier for voltage gain of 50. Assume suitable data Comment Ro & BW. **[8]**

Q7) a) With the help of schematic in detail, explore the design steps of single ended LNA. **[8]**

b) Explain BW enhancement technique of HF amplifiers. **[8]**

Q8) Write short notes on (any three): **[18]**

a) Short Channel Effect.

b) S Parameter.

c) Linearity & Isolation.

d) MOSFET capacitance and their comparisons.

Total No. of Questions : 8]

SEAT No. :

P3275

[Total No. of Pages :2

[4660]-312

M.E. (E & TC) (VLSI and Embedded Systems)

FAULT TOLERANT SYSTEM DESIGN

(Elective-III) (2008 Course) (Semester-II) (504191)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain the working of bridging fault model in detail with its advantages and disadvantages. **[8]**

b) Explain with step by step process the procedure to test sequential circuit with and without faults. **[8]**

Q2) a) Explain in brief with block diagram the general simulation process. Draw the flow diagram of event driven simulation. **[8]**

b) Define wired logic mechanism. Explain in detail with diagram wired- AND logic and Bidirectionality. **[8]**

Q3) a) Define and explain in detail with timing diagram different delay models w.r.t. 2 input AND gate. **[8]**

b) Construct a zoom Table for evaluating AND. OR, NAND and NOR gates with two input binary values. **[8]**

P.T.O.

Q4) Write short notes on following: **[18]**

a) 9-V algorithm.

b) Errors and faults.

c) Physical segmentation and Logical segmentation.

SECTION-II

Q5) a) Explain parallel fault simulation algorithm in detail with example. **[8]**

b) With neat diagram explain in detail the compression technique which provides excellent fault and error coverage. **[8]**

Q6) a) Define and explain controllability/observability using scan based DFT technique method. **[8]**

b) Classify and explain in brief BIST technique with neat block diagram, describe generic form of BIST architecture. **[8]**

Q7) a) Compare parallel and Concurrent simulation techniques w.r.t. following:- **[8]**

i) Processing of delay models ii) Storage requirements

iii) Use of logic value iv) Speed

b) Define and explain the following terms: **[8]**

i) Fault Justification ii) Fault location

iii) Fault propagation iv) Fault Efficiency

Q8) Write short notes on following: **[18]**

a) Delay models.

b) Testing of PLAs.

c) Functional Modelling.

□□□□

Total No. of Questions : 10]

SEAT No. :

P2789

[Total No. of Pages : 3

[4660] - 313

M.E. (E & TC) (VLSI & Emb System)

b- BIOMEDICAL SIGNALS & SYSTEMS

(2008 Pattern) (Elective - III) (Semester - II) (504191)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections must be written in separate answer sheets.***
3) ***Figures to right indicate full marks.***

SECTION - I

Q1) a) Define & explain following biomedical signals & draw their nature also. **[8]**

i) ECG

ii) EMG

iii) EEG

iv) PCG

b) Explain the action potential & Na^+-K^+ pump action. **[8]**

Q2) a) Distinguish between ensemble & temporal (time) averages. Identify application of first & second order averages of both types in EEG analysis. **[8]**

b) Propose a time domain technique to remove random noise, given the possibility of acquiring multiple realizations of the ECG signal or event of interest. **[8]**

Q3) a) Explain the following in reference to cardio-vascular system. **[6]**

i) Heart rate variability

ii) Arrhythmia

iii) Myocardial Infraction.

P.T.O.

b) Explain 10-20 electrode system for acquiring EEG signal. **[10]**

Q4) a) Explain the genesis of PCG signals. Also explain their correlation with ECG signal. **[9]**

b) Explain any one technique for ECG 'QRS' detection. **[9]**

Q5) a) Explain time domain technique to remove base-line drift in ECG signal using derivative based operator. **[8]**

b) Explain butterworth LPF for High frequency noise removal, also explain design steps for the same. **[8]**

SECTION - II

Q6) a) Explain the operations involved in homomorphic filter & state it's applications four any biomedical signal. **[8]**

b) State & explain four measures to characterize QRS complexes according to it's morphology. **[8]**

Q7) a) Explain the techniques of point processes parametric system modelling with simple example. **[8]**

b) State & explain the signal flow diagram of AR model with appropriate example. **[8]**

Q8) a) Explain any one technique for envelop extraction & analysis of any appropriate bio-signal activity. **[8]**

b) Explain the importance of Poisson random processes in bio-medical signal analysis. **[8]**

Q9) a) Explain adaptive segmentation also explain application of adaptive segmentation in EEG signals. **[8]**

b) Explain with example-Unsupervised & supervised pattern classification. **[8]**

Q10) Write short notes on (Any Two) **[18]**

a) Logistic Regression Analysis

b) Spectral Modelling & Analysis of PCG Signal

c) Application of Neural network in biomedical signal analysis.

☼ ☼ ☼

Total No. of Questions : 8]

SEAT No. :

P2790

[Total No. of Pages :2

[4660] - 314
M.E (E & TC) (VLSI and Embedded System)
(c) ADVANCED DIGITAL SYSTEM DESIGN
(2008 Course) (Elective - III) (Semester - II) (504191)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Describe the design issues of CISC and RISC processors. **[8]**

b) Draw and explain the interfacing diagram of 480 bus with microprocessor. **[10]**

Q2) a) Explain the BIST scheme with the help of block schematic. **[6]**

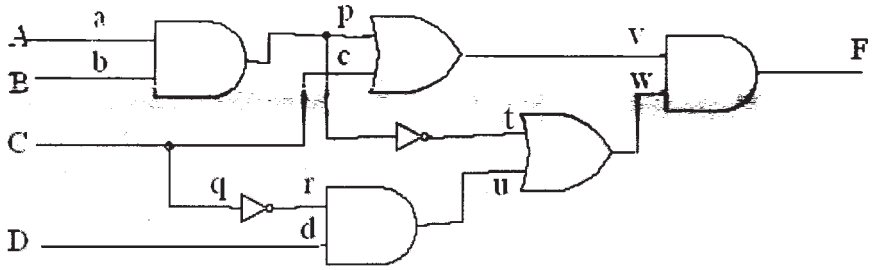
b) Draw address and data path architecture of CPU, indicate names of various blocks. Which unit of CPU sequences the data path operation? How are they implemented? **[10]**

Q3) a) i) Determine the necessary inputs to the following circuit to test for p stuck - at-0.

For this set of inputs,

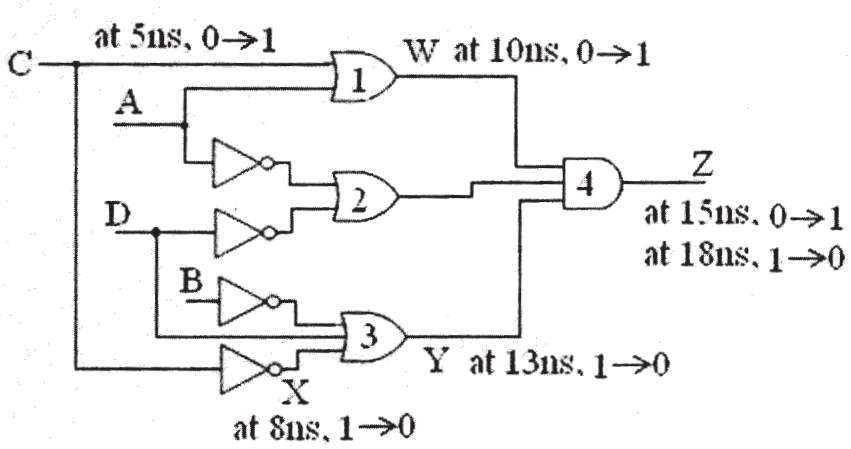
ii) Determine which other stuck-at faults can be tested.

iii) Repeat steps (i and ii) for u stuck-at-1. **[8]**



P.T.O.

b) For the given circuit draw timing diagram, identify the hazard and modify the circuit to eliminate the hazard. **[8]**



Q4) a) Design a sequence detector in which output is '1' only if the input sequence of 1001 occurs at consecutive clock pulses. **[8]**

b) What do you meant by clock skew? Explain the methods to minimize the clock skew. **[8]**

SECTION - II

Q5) Write notes on: **[18]**

a) IEEE 486 BUS

b) Boundary scan

c) Scan path techniques.

Q6) a) Model 1K × 8 Dual port RAM using VHDL. **[8]**

b) Draw $2^m \times n$ array of SRAM cells and explain operation in detail. **[8]**

Q7) a) What are the major steps to design ATM packet generator? Explain in detail. **[8]**

b) Explain ATM Switch architecture using block diagram. Discuss important steps for design of ATM switch. **[8]**

Q8) a) What is PRBS generator? Draw and explain a scheme to generate PRBS. **[8]**

b) With neat flowchart, explain steps in floating point multiplication. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2791

[Total No. of Pages :2

[4660] - 315
M.E. (E & TC) (VLSI and Embedded Systems)
a : EMBEDDED AUTOMOTIVE SYSTEMS
(2008 Course) (Open) (Elective - IV) (504192) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherver necessary.***
4) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) How electromagnetic interference is removed? Write short note on electromagnetic compatibility? **[8]**

b) Describe role of Crank angle position sensors an air mass flow sensors. **[8]**

Q2) a) What is importance of Electromagnetic interference suppression? Explain in detail. **[8]**

b) Write Short note on **[10]**

i) Digital engine control system.

ii) Electronic management of chassis system.

Q3) a) How auto-braking system contributes to vehicle motion control. **[8]**

b) Which are the components for Electronic engine management systems? Explain briefly. **[8]**

Q4) a) Explain the component of Electronic Dashboard systems and how it helps in vehicle monitoring. **[8]**

b) What are criteria of selection of micro controller for automotive applications ? Explain with suitable example. **[8]**

P.T.O.

SECTION - II

Q5) a) How Throttle position sensor, solenoids, stepper motors, relays will contribute towards vehicle control. **[8]**

b) What are recent trends and challenges in communication of electronic automotive systems. **[8]**

Q6) a) Briefly explain the technique of exhaust emission control technique. **[8]**

b) What is the role of Artificial Intelligence in modern vehicles. **[8]**

Q7) a) Classify electronics control systems in open loop and closed loop control system and explain advantages of closed loop systems? **[8]**

b) Draw and explain following fields of standard format of CAN protocol.

i) Bus Arbitration ii) Frame format **[10]**

Q8) a) Explain principle of cruise car control system with design limitations. **[8]**

b) What are the basic blocks of vehicle tracking system using GPS. **[8]**

Total No. of Questions :8]

SEAT No. :

P2792

[Total No. of Pages :2

[4660]-316

M.E. (E&TC) (VLSI & Embedded System)

b - SYSTEM ON CHIP

(2008 Course) (Elective - IV) (Semester - II) (Open) (504192)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate answer books.***
2) ***Answers any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data if necessary.***
7) ***For metal-2 : Cpoly, plate = 0.09fF/ μm2, Cpoly, fringe = 0.04 fF/μm***
   Cmetal-2, plate =0.02fF/μm2, Cmetal-2, fringe = 0.06fF/μm
   Cmetal-1, plate = 0.04fF/μm2, Cmetal-1, fringe = 0.09fF/μm
   Rmetal-1 = 0.08Ω/ □, Rmetal-2 = 0.07Ω / □, Rploy = 4Ω / □

SECTION -I

Q1) a) What do you mean by design abstraction? Explain it one example? **[8]**

b) What do mean by latch up? Why it happen? How to rectify it? **[8]**

Q2) a) What do you mean by layout synthesis? Explain any one method in detail? **[8]**

b) Explain the term wire parasitic? How it affects the CMOS operation. **[8]**

Q3) a) Differentiate single phase Vs Two phase clocking. **[8]**

b) How hot electrons are formed? What is its effect on CMOS operation? **[8]**

Q4) a) Differentiate plate capacitance Vs fringe capacitance. **[8]**

b) Define design rule and explain its role in: **[10]**

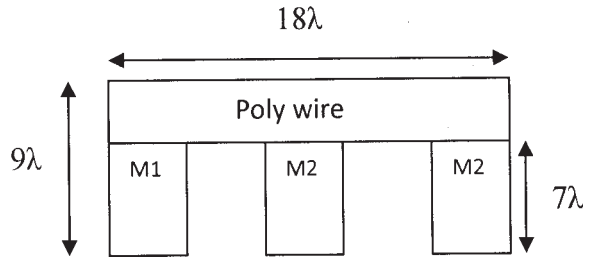
i) Fabrication error

ii) Scalable design

P.T.O.

SECTION -II

Q5) a) Compute resistance and capacitance of following wires for 0.5µm SCMOS process. **[8]**



b) Which features SoC design engineer look in layout synthesis tool? **[8]**

Q6) a) Explain with neat diagram basic structure of serial - parallel multiplier. **[8]**

b) Why DRAM is preferred over SRAM though it is slower? Explain of one transistor DRAM. **[8]**

Q7) a) What problems crop up in double phase clocking? How these can be rectified? **[8]**

b) Plot the Elmore delay for a metal 1 wire of a size 2000λ X 3λ using **[8]**

i) 2-section

ii) 4-section

In which case Elmore delay is more? Why?

Q8) a) Explain Kitchen timer floor plan. Discuss area and speed issue in detail. **[8]**

b) Explain following terms with an example: **[10]**

i) Cross talk

ii) Cross talk noise

iii) Storage capacitance

iv) Quasi state

v) Duty cycle

EEE

Total No. of Questions :10]

SEAT No. :

P2793

[Total No. of Pages :2

[4660]-317

M.E. (E & TC)(VLSI and Embedded Systems)

c - SOFTWARE DEFINED RADIO

(2008 Course) (Open) (Elective - IV) (Semester - II) (504192)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) What is Software defined radio? How software defined radio is different than conventional radio? **[8]**

b) Draw and explain the hardware architecture of SDR. **[8]**

Q2) a) Write typical characteristics of SDR and explain benefits of SDR. **[8]**

b) Enlist various factors considered while designing the dynamic range of SDR receiver. **[8]**

Q3) a) Explain different types of transmitters used for SDR. **[8]**

b) State and explain various RF front ends used in SDR. **[8]**

Q4) a) Explain what are the various component requirements of SDR? **[8]**

b) What is Software Component Architecture? Explain its requirements. **[8]**

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

a) SDR Forum

b) SDR hardware development issues (FPGA/CPLD/ASIC)

c) SPEAKEASY

d) CORBA

e) Joint Tactical Radio System

P.T.O.

SECTION -II

Q6) a) What is smart antenna? Explain any one smart antenna architecture. **[8]**

b) What are different adaptation algorithms used in smart antenna? Explain any one. **[8]**

Q7) a) Discuss the components involved in hardware implementation of smart antennas. **[8]**

b) Explain how smart selection of ADC/DAC enables better design of SDR? **[8]**

Q8) a) Explain how the DSP processors play an important role in SDR? **[8]**

b) What are the parameters to be considered while selecting a processor for SDR? **[8]**

Q9) a) What factors should be considered while selecting the RTOS in development of SDR? **[8]**

b) What are different development tools used for SDR? **[8]**

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

a) Mobile Application Environment.

b) GNU Radio.

c) Military application of SDR.

d) Core framework in SDR.

e) Future of SDR.

EEE

Total No. of Questions :8]

SEAT No. :

P2794

[Total No. of Pages :2

[4660]-318

M.E. (E&TC) (VLSI and Embedded System Design)
d - HIGH PERFORMANCE COMPUTER NETWORKS (Com. to I.T)
(2008 Course) (Open) (Elective -IV) (Semester - II) (504192)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) What is gigabit Ethernet? Explain its protocol architecture. **[8]**

b) Explain various delays in communication links. **[8]**

Q2) a) Explain functional and protocol architecture of B-ISDN. **[8]**

b) Explain techniques of Frame Relay Congestion control. **[8]**

Q3) a) Explain quality of service in HPCN. **[8]**

b) Describe SRP Protocol and discuss authentication issues. **[8]**

Q4) Write short notes (any 3): **[18]**

a) ATM Services.

b) M/M/I Queuing system

c) Network design issues

d) Comparison of X.25 and frame relay

e) Switching Techniques

P.T.O.

SECTION -II

Q5) a) What is DSL? Explain different types of DSL. **[8]**

b) Describe what is 'Discrete Multi-tone technique' with neat block diagram. **[8]**

Q6) a) Explain SONET with layered Architecture. **[8]**

b) Explain the architecture of storage area network. **[8]**

Q7) a) Explain GSM architecture. What are security issues in GSM. **[8]**

b) Compare Wi-Fi and Wi-Max technologies. **[8]**

Q8) Write short notes on: **[18]**

a) 802.11 Vs. 802.16

b) DWDM

c) RAID

d) Fiber Channel protocol Architecture

e) CDMA

EEE

Total No. of Questions :8]

SEAT No. :

P2795

[Total No. of Pages :4

[4660]-319

M.E. (E&TC) (Signal Processing)

LINEAR ALGEBRA AND RANDOM PROCESSES

(2008 Course) (Semester - I) (504501)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) If A be any square matrix, then show that $A + A'$ is symmetric and $A - A'$ is skew symmetric. **[4]**

b) Find the non-singular matrices P&Q such that PAQ is in the normal form,

where $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & -1 \\ 3 & 1 & 1 \end{bmatrix}$

Also find the rank of the matrix A. **[8]**

c) Show that the equations,

$x + y + z = 6, \quad x + 2y + 3z = 14, \quad x + 4y + 7z = 30$

are consistent and solve them. **[6]**

Q2) a) If A is non-singular, prove that the eigen values of A^{-1} are the reciprocals of the eigen values of A. **[4]**

b) Obtain the characteristic equation of the matrix,

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

and verify that it satisfies Caley Hamilton theorem and hence find its inverse. **[6]**

P.T.O.

c) Prove that

$$\Delta = \begin{vmatrix} 2bc-a^2 & c^2 & b^2 \\ c^2 & 2ac-b^2 & a^2 \\ b^2 & a^2 & 2ab-c^2 \end{vmatrix} = \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^2 = (a^3+b^3+c^3-3abc)^2 . \quad \textbf{[6]}$$

Q3) a) If AB = A & BA = B then $B'A'=A'$ and $A'B'=B'$. Hence prove that A' and B' are idetopotent. **[4]**

b) Determine the characteristic roots and the corresponding characteristic vectors of matrix.

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix} \quad \textbf{[8]}$$

c) Show that vectors $X_1 = (3, 1, -4)$, $X_2 = (2, 2, -3)$ form a linearly independent set. **[4]**

Q4) a) Show that rank of a matrix with every element of which is unity is 1. **[4]**

b) Prove that matrix $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is diagonizable.

Also find diagonal form & diagonalizing matrix P. **[6]**

c) Determine whether the matrix $A = \begin{bmatrix} \frac{1+i}{2} & \frac{-1+i}{2} \\ \frac{1+i}{2} & \frac{1-i}{2} \end{bmatrix}$ is unitary? **[6]**

SECTION -II

Q5) a) Two cards are drawn from a pack of 52 cards successively without replacing the first. **[6]**

i) Given the 1st one is heart, what is the probability that the 2nd is also heart?

ii) Given the 1st card is heart and not 10 and 2nd card is a 10.

iii) What is probability that both cards will be hearts?

b) The probability of receiving a bit error is $P_e = 10^{-5}$. What is the probability of receiving two digits error in a sequence of 8 digits? **[3]**

c) A student arrives late for a class 40% of the time. Class meets five times each week. Find **[9]**

i) Probability of student being late for at least three classes in a given week.

ii) Probability of student being late for two classes in a given week.

iii) Probability of student will not be late atall during a given week.

Q6) a) List the properties of CDF and PDF. **[6]**

b) In an experiment choosing an integer I randomly where I is defined as $-1 \le I \le 3$. Random variable $X = \frac{1}{2}I^2$. Plot CDF of X and use it to calculate the probabilities of **[10]**

i) $X \le 0$

ii) $2 < X \le 3$

iii) $X < 2$

iv) $X \ge 2$

v) $X > 2$

Q7) a) Joint density function of 2 random variables is

$$f_{xy}(x, y) = x^2 y \text{ for } 0 < x, y < 2$$

$$= 0 \text{ otherwise.}$$

Find marginal density functions $f_X(x), f_Y(y)$. Check whether 2 RV's are statistically independent. **[5]**

b) Find the expectation E[X] of a random variable X which is defined by,

$$X = \begin{cases} -2, & \text{with probability } 1/4 \\ 3, & \text{with probability } 1/2 \\ 1, & \text{with probability } 1/4 \end{cases}$$

Also find E [2X + 5] and E [X^2]. **[6]**

c) Explain with an example Uniform distribution function. List the equation of mean, variance & std deviation. **[5]**

Q8) a) Write a short note on Narrow Band noise. **[5]**

b) Derive an expression of noise power spectral density at the output of an LTI filter. **[6]**

c) Explain Weiner process along with an example. **[5]**

EEE

Total No. of Questions :8]

SEAT No. :

P2796

[Total No. of Pages :2

[4660]-321
M.E. (E&TC) (Signal Processing)
SIGNAL PROCESSING TECHNIQUES
(2008 Revised Course) (Semester - I) (504502)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data wherever required.***
5) ***Figures to the right indicate full marks.***

SECTION -I

Q1) a) The signal $x(t) = \sin(10\pi t + 2\sin(20\pi t) - 2\cos(30\pi t)$ is sampled with sampling frequency of 20 Hz. Find the frequencies in the DT signal after sampling. Is there any aliasing? **[8]**

b) Explain the use of transforms,. Find the relation between Z transform and Fourier transform. **[8]**

Q2) a) Find Z transform for following sequences. **[10]**

i) $f(n) = \sin(n\omega T)$ for $n \geq 0$.

ii) $f(n) = \begin{cases} 1 \; for \; n < 0 \\ (0.5)^n \; for \; n \geq 0 \end{cases}$

b) If $x(n) = a^n u(n) \leftrightarrow \frac{Z}{Z-a}$ with $ROC|Z| > a$ find ZT of $x(n) = na^n u(n)$ using property of differentiation in Z domain. **[8]**

Q3) a) If $X(Z) = \frac{Z+1}{3Z^2 - 4Z + 1}$, Find x(n) if ROC is |Z|>1 using partial fraction expansion method. **[8]**

b) If $X(Z) = \frac{1}{1 - aZ^{-1}}$ for |Z|<a find x(n). **[8]**

P.T.O.

Q4) a) Consider the sequence x(n)={0 1 2 3}. Find DFT. Explain the property of circular time shifting. **[8]**

b) Explain decimation in frequency FFT algorithm. **[8]**

SECTION -II

Q5) a) Design a low pass FIR filter using Fourier series expansion method that approximates **[8]**

$$H_d(f) = \begin{Bmatrix} 1 for\ 0 \le f \le 1000Hz \\ 0\ otherwise \end{Bmatrix}$$

b) What is windowing? Explain Gibbs phenomenon. **[8]**

Q6) a) Design 11 coefficient FIR LPF using frequency sampling method with cut off frequency of 2Fs/11 where Fs is a sampling frequency. **[10]**

b) Compare the performance of different window functions. **[8]**

Q7) a) Explain the method of backward difference method for IIR filter design. Convert the filter with transfer function H(S)=1/S+1 into a digital filter using backward difference method. **[8]**

b) Convert a second order DT Butterworth filter with cut off frequency of 1 KHz and sampling frequency of 10 KHz using BLT method. **[8]**

Q8) a) Explain Remez exchange algorithm for adaptive filter design. **[8]**

b) Draw the cascade form realization for the filter with transfer function

$$H(Z) = \frac{1}{1 - 3Z^{-1} + 2Z^{-2}} .$$ **[8]**

EEE

Total No. of Questions :8]

SEAT No. :

P2797

[Total No. of Pages :2

[4660]-322
M.E. (E&TC) (Signal Processing)
a - DIGITAL IMAGE PROCESSING
(2008 Pattern) (Elective - I) (Semester - I) (504503)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Explain simultaneous contrast effect with example. **[8]**

b) What is false contouring? Explain. **[8]**

Q2) a) What is Pseudo coloring? Give its applications. **[8]**

b) Explain how power law transformation can be used for Image enhancement. **[8]**

Q3) a) State equations of Forward two dimensional DCT and its inverse. What is meant by Basis image? Find Basis image $C_{1,1}$ for N=4. **[8]**

b) Define 2D Haar Transform. Explain its properties. **[8]**

Q4) You are given an image that suffers from the following problems related to the image quality. **[18]**

a) Image does not have enough contrast. Most of the area in the image appears to be bright.

b) The structures and boundaries in the image are blurred and thus it is hard to see the objects in the image.

c) There are random sparse black spots (pepper noise)

Suggest and explain image processing algorithms to enhance the quality for each problem.

P.T.O.

SECTION -II

Q5) a) Discuss and compare the edge detection using following operators. **[8]**

i) Sobel operator

ii) Laplacian operator

b) Explain image segmentation using local thresholding and global thresholding. What is meant by optimum threshold? **[8]**

Q6) a) Explain how we can describe object boundary using B-spline function. **[8]**

b) Explain quad tree based region descriptor. **[8]**

Q7) a) With block diagram explain compression standard for still images. **[8]**

b) Explain image compression using fractals. **[8]**

Q8) Write short notes on: **[18]**

a) Image restoration.

b) Arithmetic coding.

c) Image segmentation using motion.

EEE

Total No. of Questions :8]

SEAT No. :

P2798

[Total No. of Pages :2

[4660]-324

M.E. (E&TC) (Signal Processing)

c - ARTIFICIAL INTELLIGENCE

(2008 Pattern) (Elective - I) (Semester - I) (504503)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Explain the following: **[8]**

i) Goal - based agent

ii) Utility - based agent

iii) Reflex agent

iv) Model based agent

b) With suitable example explain the structure of intelligent agent. **[8]**

Q2) a) Explain the MINIMAX algorithm with suitable example. **[8]**

b) Explain the role of events in knowledge representation and reasoning system. **[8]**

Q3) a) Explain breadth first search and depth first search algorithm with suitable program. **[10]**

b) With suitable example, explain the heuristic search approach to solve the search problem. **[8]**

Q4) a) Explain a partial order planning algorithm. **[8]**

b) What is first order logic? Show with an example how it can be used to represent knowledge. **[8]**

P.T.O.

SECTION -II

Q5) a) Explain learning by decision trees. **[8]**

b) How Bayes rule helps in quantifying the uncertainty? **[8]**

Q6) a) How sequential decision problems can be solved to produce optimal behavior that balances the risk and rewards of acting in an uncertain environment? **[8]**

b) Explain how a planning graph can be used to give better heuristic estimates. **[8]**

Q7) a) Discuss the following terms with respect to the utility theory. **[8]**

i) Orderability

ii) Transitivity

iii) Continuity

iv) Substitutability

b) Elaborate role of artificial neural networks in adaptive learning. **[8]**

Q8) Write short notes on: **[18]**

a) Supervised learning

b) Perception

c) Multiagent systems

EEE

Total No. of Questions :8]

SEAT No. :

P2799

[Total No. of Pages :2

[4660]-325
M.E. (E&TC) (Signal Processing)
a - BIOMEDICAL SIGNAL PROCESSING
(2008 Course) (Elective - II) (Semester - I) (504504)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Explain Operating Principle and Specification for the transducer to measure temperatures. **[8]**

b) Discuss the characteristics of blood flow in detail? **[8]**

Q2) a) Describe with neat block diagram of generalized bio-instrumentation system? **[8]**

b) Explain the characterization of signal in frequency domain? **[8]**

Q3) a) Describe the cell bio-electric phenomenon with a neat figure? **[8]**

b) Describe explain the Heart structure in detail? **[8]**

Q4) Write a short note on: **[18]**

a) Sonography technique

b) ECG technique

SECTION -II

Q5) a) Explain adaptive cancellation of interference with proper illustration? **[8]**

b) Explain the Back-projection method of image reconstruction used in computed tomography? **[8]**

P.T.O.

Q6) a) Explain how is autocorrelation function helpful in finding periodicity in signals? **[8]**

b) Describe wavelet signal decomposition? **[8]**

Q7) a) Draw Autocorrelation function for. **[8]**

X(n) = [0, -1, 0.25, -1, 0.75, 0.25, -1, 0, 0.32]

b) What is the techniques used to study fetal electro-cardiography. Explain the technique? **[8]**

Q8) a) Discuss Z -transform & explain properties of Z- transform? **[9]**

b) Describe the technique for Event detections? **[9]**

EEE

Total No. of Questions :8]

SEAT No. :

P2800

[Total No. of Pages :3

[4660]-326

M.E. (E&TC) (Signal Processing)

b -WIRELESS & MOBILE COMMUNICATION

(2008 Course) (Elective - II) (Semester - I) (504504)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Q.1 & Q.5 are compulsory.***
2) ***Solve any two questions from Q.2, Q.3 & Q.4 from section I.***
3) ***Solve any two questions from Q.6, Q.7 & Q.8 from section II.***
4) ***Answer to the two sections must be written in separate sheets.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Figures to the right indicate full marks.***
7) ***Assume suitables data if necessary.***
8) ***Use of logarithmic tables, non-programmable calculators allowed.***

SECTION -I

Q1) a) What is cell sectoring? Enlist Advantages and Disadvantages of cell sectoring. **[6]**

b) Consider a GSM TDMA system with following parameters: **[6]**

- $N_R = 2$
- $N_T = 24$ Frames of 120ms each with 8 time slots per frame.
- $b_r = 148$ in each of 8 time slots.
- $b_p = 34$ in each of 8 time slots.
- $b_g = 8.25$ in each of 8 time slots.
- $T_f = 120$ms
- $R_{rf} = 270.8333333$ kbps.
- $R = 22.8$ kbps.

Calculate:

i) Frame Efficiency

ii) No. of channels per frame

c) Explain with the help of suitable examples how Cell Splitting helps in increasing the traffic handled. **[6]**

P.T.O.

Q2) a) Explain in detail Ground Reflection (Two Ray) model for mobile radio propagation. **[8]**

b) Describe three basic propagation mechanisms used for mobile radio propagation. **[8]**

Q3) a) Describe the significance of equalization. Also discuss Linear and Non-Linear equalization techniques. **[8]**

b) Enlist various algorithms used for adaptive equalization. Explain any one algorithm in detail. **[8]**

Q4) a) Explain the following effects encountered in Cellular Mobile Communication: **[10]**

i) Long term Fading,

ii) Short term Fading,

iii) Delay Spread,

iv) Coherence Bandwidth.

b) What are the causes of fast and Slow Fading. Distinguish between them. **[6]**

SECTION -II

Q5) a) A mobile is located 5km away from the base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2.55dB to receive cellular radio signals. The E field at 1km from the transmitter is measured to be 10^{-3} V/m. The carrier frequency used for this system is 900 MHz. **[8]**

i) Find the length and the effective aperture of the receiving antenna.

ii) Find the received power at the mobile using the two ray ground reflection model assuming the height of the transmitting antenna to be 50 mtrs. and the receiving antenna is 1.5 mtr. above ground.

b) Explain with neat diagram GSM architecture and various interfaces.**[10]**

Q6) a) Explain various handover mechanisms in GSM. **[6]**

b) Explain the concept of waveform encoder & source encoders in GSM technology. **[6]**

c) Explain in detail the TDMA frame structure of GSM. **[4]**

Q7) a) How does the near far effect influence CDMA systems? What are the countermeasures in CDMA systems? **[8]**

b) Explain forward and reverse channel parameters of IS-95 CDMA. **[8]**

Q8) Explain the following: **[16]**

a) Various services offered by GSM.

b) Antenna Pattern Ripple Effect.

c) IS 95 Vocoders.

d) CDMA 2000.

EEE

Total No. of Questions : 8]

SEAT No. :

P3330

[Total No. of Pages : 2

[4660]-327

M.E. (E&TC) (Signal Processing) (Semester - I)

SMART ANTENNAS

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***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.***
8) ***All questions are compulsory.***

SECTION - I

Q1) a) Explain the basic array characteristics. **[8]**

b) Write a short note on planer arrays. **[8]**

Q2) Explain the following terms for Linear Arrays **[18]**

a) Beamwidth

b) Grating lobes

c) Sidelobes

Q3) a) Explain Antenna Null Rotation. **[8]**

b) Write a short note on multiple Null formation. **[8]**

P.T.O.

Q4) a) Explain Electronic Null sterring. **[8]**

b) Write a short note on the Davies Beamformer. **[8]**

SECTION - II

Q5) a) Explain how orthogonality is achived by projections. **[8]**

b) Explain covariance matrices for Adaptive Arrays. **[8]**

Q6) a) Discuss Least mean Square (LMS) Error criterion. **[8]**

b) Explain maximization of probability of Detection. **[8]**

Q7) a) Explain different Gradient methods. **[8]**

b) Explain optimization of power pattern. **[8]**

Q8) Write short note on : **[18]**

a) Real Time Least Mean Square Error Algorithm.

b) Direct maximization of SNR.

c) Meaning of Adaptivity.

Total No. of Questions :8]

SEAT No. :

P3276

[Total No. of Pages :2

[4660]-328
M.E. (E & TC) (Signal Processing)
STATISTICAL SIGNAL PROCESSING
(2008 Pattern) (Semester - II) (504507)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) How to model a signal when only a finite data record is available. **[8]**

b) Differentiate between Pade's method and Prony's method. **[8]**

Q2) a) State and explain Levinson - Durbin algorithm. **[8]**

b) Using Levinson - Durbin algorithm, find a third order all pole model for a signal having auto correlation values,

$\gamma_x(0) = 1, \gamma_x(1) = 0.5, \gamma_x(2) = 0.5, \gamma_x(3) = 0.25$ **[8]**

Q3) a) Derive and compare the Wiener - Hopf equations of the noncausal IIR Wiener filter and FIR Wiener filter. **[9]**

b) Compare the performance of spectrum estimation methods like periodogram, Bartlett's method and Welch's method. **[9]**

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

a) Minimum variance spectrum estimation.

b) Parametric and non-parametric power spectrum estimation.

P.T.O.

SECTION -II

Q5) a) Consider a signal $x(n) = s(n) + w(n)$ where $s(n)$ is an AR(1) process that satisfies the difference equation

$$s(n) = 0.6\ s(n-1) + v(n)$$

where $v(n)$ is a white noise sequence with variance, $\sigma_v^2 = 0.64$ and $\{w(n)\}$ is a white noise sequence with variance, $\sigma_w^2 = 1$. Design a Wiener filter of length M = 2 to estimate $s(n)$. **[8]**

b) What are the limitations of causal Wiener filter? How are they overcome using Kalman filter? **[8]**

Q6) a) Determine the Lattice filter coefficients corresponding to FIR filter with system function, $H(z) = 1 + \frac{13}{24} z^{-1} + \frac{5}{8} z^{-2} + \frac{1}{3} z^{-3}$. **[8]**

b) Explain the use of Wiener filter for noise cancellation. **[8]**

Q7) a) For a signal whose first six values are X = [1, 1.500, 0.750, 0.375, 0.1875, 0.0938]^T use Pade's approximation to find **[6]**

i) Second order all pole model,

ii) Second order moving average model,

iii) A model containing one pole and one zero.

b) Define and explain AR, MA and ARMA models. **[6]**

c) Explain the modifications to Bartlett's method to obtain Welch's method. **[4]**

Q8) Write short notes on: **[18]**

a) Shank's method.

b) FIR least squares inverse filter.

c) Use of DFT in power spectrum estimation.

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Total No. of Questions : 8]

SEAT No. :

P3413

[Total No. of Pages : 3

[4660] - 329
M.E. (E & TC) (Signal Processing)
ADVANCED DIGITAL SIGNAL PROCESSING
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:-

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

SECTION - I

Q1) a) Explain in detail methods adopted for interfacing digital systems with different sampling rates. Where do you need it? Explain the concept of up-sampling & down-sampling with the help of block diagram & waveforms. **[10]**

b) Consider the two different ways of cascading a decimator and interpolator as shown in following figure : **[8]**

$x(n) \rightarrow \boxed{\uparrow I} \rightarrow \boxed{\downarrow D} \rightarrow y_1(n)$

$x(n) \rightarrow \boxed{\downarrow D} \rightarrow \boxed{\uparrow I} \rightarrow y_2(n)$

i) If D = I, show that the output of two configurations are different. Hence in general the two systems are not identical.

ii) Show that the two systems are identical if and only if D and I are relatively prime.

P.T.O.

Q2) a) What is the meaning of polyphase filter? Draw a polyphase interpolator for interpolation factor of 4. Set the length of filter be 16. Explain how multiplication with zero is avoided. **[8]**

b) Design a two stage decimator that downsamples an audio signal by a factor of 30 & satisfies the following specifications : **[8]**

Input sampling frequency, Fs = 240 KHz

Highest frequency of interest = 3.4 KHz

Passband ripple δp = 0.05

Stopband ripple δs = 0.01

Choose the decimation factor pairs as 15×2 and 10×3 and give detailed analysis of computational & storage complexities to justify your answer. Specify sampling frequencies at the input and output of each stage of decimation and for each decimation filter find :

i) the band edge frequencies

ii) the normalized transition width

iii) pass band & stop band ripples

iv) filter length

Q3) a) Describe the use of least square methods for system modelling. **[8]**

b) What is deconvolution. How will you use predictive deconvolution for data processing. **[8]**

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

a) Sub-band coding of speech signal.

b) Backward linear prediction.

c) AR lattice structure.

d) System Identification based on ARMA system.

SECTION - II

Q5) What do you mean by Adaptive filtering? Describe the LMS algorithm for adaptive filtering. Explain one application of adaptive filtering. **[16]**

Q6) a) Discuss how adaptive beam former can be used in radar and sonar application. **[8]**

b) Explain the least square lattice algorithm. What is the meaning of gradient adaptive lattice filter? **[8]**

Q7) a) Explain the architecture of DSP processor with block diagram. Explain the difference between Micro-processor and DSP architecture. **[8]**

b) Compare the features of TMS 320C54XX and ADSP 21XX. **[8]**

Q8) a) Write short notes on : **[8]**

i) Barrel shifter

ii) MAC

iii) Circular Addressing

iv) ALU

b) Write short notes on (any two) : **[10]**

i) Wiener filter.

ii) Modified Harvard Architecture.

iii) Adaptive filter application to Geophysics.

Total No. of Questions :8]

SEAT No. :

P2801

[Total No. of Pages :2

[4660]-330
M.E. (E&TC) (Signal Processing)
VLSI IN SIGNAL PROCESSING
(2008 Course) (Semester - II) (504509)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the trwo sections must be written in separate sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitables data if necessary.***
6) ***Use of logarithmic tables, slide rules, electronic pocket calculator and steam table is allowed.***

SECTION -I

Q1) a) Explain longest path algorithm with an example. **[8]**

b) Explain DSP application demands & scaled CMOS Technologies. **[8]**

Q2) a) What are the retiming techniques? Explain cut set retiming. **[8]**

b) Explain systolic array design with an example. **[8]**

Q3) a) List & explain the applications of unfolding. **[8]**

b) Explain with the help of an example the algorithm to retime a DFG for clock period minimization. **[8]**

Q4) Write short note on following: **[18]**

a) Pipelining & parallel processing for low power.

b) Properties of retiming.

c) Systolic design for matrix multiplication.

P.T.O.

SECTION -II

Q5) a) Explain parallel multipliers, also state the types of it. **[8]**

b) Explain with neat schematic 4*4 Baugh Wooley multiplier. **[8]**

Q6) a) Explain with neat diagram Booth Wallace Tree Multiplier. **[8]**

b) Explain various resources and routing resources made available in FPGA. **[8]**

Q7) a) Describe different clock distribution strategies. Explain in brief the merits and demerits of each. **[8]**

b) Explain in detail architecture for FPGA. **[10]**

Q8) Write short note on any two of following: **[16]**

a) VLSI design flow for implementation on FPGA.

b) Retiming Techniques.

c) Applications of DCM available.

EEE

Total No. of Questions : 8]

SEAT No. :

P2802

[Total No. of Pages : 2

[4660] - 332
M.E. (E & TC) (Signal Processing)
b: DIGITAL SIGNAL COMPRESSION
(2008 Course) (Semester - II) (Elective -III) (504510)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What is a prefix code? Explain how to check if a code is a prefix code using a root tree. Define self-information associated with the event. **[8]**

b) For the wavelet decomposition shown below, **[10]**

26	6	13	10
-7	7	6	4
4	-4	4	-2
2	-2	-3	0

Find the bit stream generated after first and second pass by SPIHT coder.

Q2) a) Explain Linear Predictive coding for speech. How to select the order of the predictor. **[8]**

b) Consider a source with symbol probabilities $P(a_1) = 0.6$, $P(a_2) = 0.05$ and $P(a_3) = 0.35$. Find the tag using arithmetic coding for a sequence a_1, a_3, a_2. **[8]**

Q3) a) What is adaptive quantization? How step size will adaptively change by tracking the statistics of signal? How to select optimal delta? **[8]**

b) Explain rate distortion theory? How it minimizes distortion? **[8]**

P.T.O.

Q4) a) Explain how MIDI is used for interfacing musical instruments. **[8]**

b) What are advantages of ADPCM over PCM technique? Explain ADPCM with block schematic in detail. **[8]**

SECTION - II

Q5) a) Explain the effect of variance mismatch on the performance of a uniform quantizer. Plot SNR Vs. ratio of input to design variance. **[8]**

b) What is streaming audio? How to decide buffer size? **[8]**

Q6) a) What is companding? Why companding is must for speech signal. Explain A-law and μ– law. **[8]**

b) What is subband coding? What is its advantage? Describe the filters used for subband coding. **[8]**

Q7) a) Explain Discrete Cosine transform and its properties. How the image compression is achieved by coding of DCT coefficients. **[8]**

b) Explain how to decide the transmission rate if the tolerable distortion is given. **[8]**

Q8) a) Explain block diagram of Video Coding Layer (VCL) for motion estimation & compression. **[9]**

b) With the help of suitable block diagram explain the encoding and decoding process in JPEG 2000. **[9]**

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Total No. of Questions : 8]

SEAT No. :

P2803

[Total No. of Pages : 2

[4660] - 333
M.E. (E & TC) (Signal Processing)
c: MULTIMEDIA TECHNIQUES
(2008 Pattern) (Semester - II) (Elective - III) (504510)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are MIDI messages? **[8]**

b) Compare. wav format & .bmp format. **[8]**

Q2) a) An NTSC encoded video clip has a frame size of 720×480 pixels & is digitizing using a bit-depth of 8 bits for each Y, Cb & Cr & a chroma sub-sampling scheme of 4:2:2. Calculate the file size of a 1 min. video clip & total time taken for it to be transmitted over a 1Mbps transmission line. **[8]**

b) Compare different standards used by the different countries for colour TV transmission and reception. **[8]**

Q3) a) Explain the steps in creating 3D animation. **[8]**

b) What are different Multimedia applications? **[8]**

P.T.O.

Q4) Write short notes on any three: **[18]**

a) Salient features of a typical audio editing software.

b) Working of Digital camera.

c) Audio file formats

d) MPEG compression.

SECTION - II

Q5) a) Explain different Text compression methods. **[8]**

b) With the help of suitable block diagram, explain JPEG compression standard for video. **[8]**

Q6) a) Explain the features of typical scanning software. **[8]**

b) Compare Lossy and lossless compression. **[8]**

Q7) a) Explain Line-drawing algorithm and circle-drawing algorithm. **[8]**

b) Explain the salient features of a typical scanning software. **[8]**

Q8) Write short notes on any three: **[18]**

a) Types of Animation.

b) Hypermedia and Hypermedia.

c) Chroma subsampling schemes.

d) Multimedia authoring tools.

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Total No. of Questions : 8]

SEAT No. :

P3277

[Total No. of Pages : 2

[4660] -334

M.E. (E & TC) (Signal Processing)

a - RADAR & SATELLITE SIGNAL PROCESSING

(2008 Course) (Semester - II) (Elective - IV) (504511)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Q.1 & Q.5 are compulsory.***
2) ***Solve any two questions from Q.2, Q.3 & Q.4 for Section I.***
3) ***Solve any two questions from Q.6, Q.7 & Q.8 for Section II.***
4) ***Answers to the two sections must be written in separate sheets.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Figures to the right indicate full marks.***
7) ***Assume suitable data; if necessary.***

SECTION - I

Q1) a) Explain the basic principles of a radar system with neat block diagram. Give the limitations and applications of radars. **[8]**

b) Derive the radar range equation? Explain the factors that affect the maximum range of radar. **[6]**

c) Explain the concept of Doppler effect associated with moving targets with mathematical relevance. **[4]**

Q2) a) Explain with neat block diagram the working principle of military radar system. Also discuss the various additional features available in military radars. **[8]**

b) Explain with neat block diagram the working principle of Moving Target Indicator (MTI) radar. **[8]**

Q3) a) Discuss various types of antennas used for RADAR applications. Also discuss the polarization for the antennas used. **[6]**

b) Explain the concept of "Pulse Compression". **[6]**

c) Differentiate between Continuous Wave & Pulsed radar systems. **[4]**

P.T.O.

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

a) Frequency Diversity radar

b) Blind Speeds

c) Radar Clutters

d) Radar Beacons

SECTION - II

Q5) a) Explain the technique of TDMA. How TDMA network is advantageous over FDMA network? **[8]**

b) What is a geostationary orbit? Which conditions should be fulfilled to attain a geostationary orbit? Also List the advantages and disadvantages of GEO satellites. **[10]**

Q6) a) Write a note on Tracking System. List its characteristics. **[6]**

b) List and discuss the various orbits defined for satellite communication. **[6]**

c) Write a note on Equivalent Isotropic Radiated Power (EIRP). **[4]**

Q7) a) Explain ALOHA and discuss various forms of ALOHA with their limitations. **[8]**

b) Explain various considerations for look angle calculations for geo stationary satellites. **[8]**

Q8) Write short notes on: **[16]**

a) Orbital Perturbations.

b) Antennas used in Satellite Communication.

c) Argument of Perigee

d) Reciprocity theorem used for Antenna.

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Total No. of Questions : 8]

SEAT No. :

P2804

[Total No. of Pages : 2

[4660] - 335

M.E. (E & TC) (Signal Processing)

b- OPERATING SYSTEMS AND OPEN SOURCE SYSTEMS

(2008 Pattern) (Semester - II) (Elective - IV) (504511)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Mention different file allocation methods. Explain any one method of file allocation. **[9]**

b) Compare contiguous and non-contiguous memory allocation. **[9]**

Q2) a) Define deadlocks. Explain banker's algorithm for deadlock detection and avoidance with suitable example. **[8]**

b) What is scheduling? Differentiate between pre-emptive and non-preemptive scheduling. Explain one method of scheduling for each. **[8]**

Q3) a) Explain virtual memory using segmentation. **[8]**

b) Explain RAID. **[8]**

Q4) a) What are the different algorithms for Disk arm scheduling? Explain any one of them. **[8]**

b) What is an access matrix explain its implementation. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain memory management in Linux. **[9]**

b) What are the primary goals of the conflict resolution mechanism used by the Linux kernel for loading kernel modules? **[9]**

Q6) a) Explain interprocess communication in Linux. **[8]**

b) Explain the various components of Linux System. **[8]**

Q7) a) What are the advantages and disadvantages of writing an operating system in a high level language, such as C? **[8]**

b) Explain Open Solaris architecture. **[8]**

Q8) a) Explain swapping and paging in Linux. **[8]**

b) Explain the Linux security model. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P2805

[Total No. of Pages : 2

[4660] - 336
M.E. (E & TC) (Signal Processing)
c- COMPUTER VISION
(2008 Pattern) (Semester - II) (Elective -IV) (504511)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if required.***

SECTION - I

Q1) a) What is perspective projection? Discuss its properties. **[8]**

b) If the camera is translated by 3 units in X direction & rotated by +90 degrees around. Z axis w.r.t. world coordinate frame, find camera coordinates of point (2,0,1). **[8]**

Q2) a) What is demosaicing? Explain any one demosaicing algorithm. **[8]**

b) Explain principle of pinhole camera. Why it is important to have hole size very small. **[8]**

Q3) a) Explain working of fovean color Image sensor. **[6]**

b) Explain full frame CCD Image sensor. **[6]**

c) Compare CCD & CMOS Image sensor. **[6]**

Q4) Write short notes on

a) Camera calibration. **[8]**

b) Stereo Matching. **[8]**

P.T.O.

SECTION - II

Q5) a) What is fundamental matrix? How we can find fundamental matrix by eight point algorithm. **[9]**

b) Explain epipolar geometry. Epipolar line and epipoles. **[9]**

Q6) a) What information we get from infrared images? Explain why we can use infrared images even during night hours. **[8]**

b) Explain principle of tomography. **[8]**

Q7) a) Explain point tracking using Harris corner detector. **[8]**

b) Discuss aperture problem in optical flow estimation. How it is solved. **[8]**

Q8) a) Explain ordering constraint & continuity constraint in stereo matching. **[8]**

b) Discuss metrics used to find correspondence in stereo matching. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P2806

[Total No. of Pages : 3

[4660] - 337

M.E. (E & TC) (Communication Networks)

CODING & MODULATION TECHNIQUES

(2010 Pattern) (Semester - I) (504601)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Consider five source symbols of a discrete memory less source and their probabilities as shown below. Follow Huffman's algorithm to find the code word each message. Also find codeword length and average information per massage. Assume M = 2.

m1 = 0.4, m2 = 0.2, m3 = 0.2, m4 = 0.1, m5 = 0.1. **[8]**

b) What is Source coding Technique? Encode the string 0 1 1 1 0 0 1 0 0 1 0 1 1 1 0 1 using Limpel-Ziv algorithm. **[8]**

Q2) a) A voice grade channel of telephone network has a bandwidth of 3.4 kHz. **[8]**

i) Calculate the information capacity of the channel for signal to noise ratio of 30dB.

ii) Calculate minimum signal-to-noise ratio required to support information transmission through the telephone channel at a rate of 9600bps.

b) Consider 3 flip flops namely FF1, FF2, and FF3, whose input and outputs are D1Q1, D2Q2, D3Q3 resp. Output of parity generator is connected to input of FF1 and output of FF2 and FF3 connected at input of parity generator. Draw PN code generator and generate PN code sequence if initially Q1Q2Q3 are 001. Draw its waveform. **[8]**

P.T.O.

Q3) a) Explain following interfaces with respesct to architecture of CDMA 2000

Also draw architecture of CDMA 2000 **[8]**

i) Rm

ii) Um

iii) Abis links

b) Explain the Rician multipath fading phenomenon and its statistical properties. **[8]**

Q4) Write short notes [any two] **[18]**

a) OFDM

b) Video compression

c) IS-95

SECTION - II

Q5) a) Define the following terms in case of wave propagation. **[8]**

i) Actual height

ii) Virtual height

iii) Critical frequency

iv) MUF

b) Explain the coherent detection technique and Cost as loop receiver model. **[8]**

Q6) Explain in detail the comparison schemes of modulation techniques, considering various requirements with neat diagrams. **[16]**

Q7) a) Writes the step for Huffman source coding Algorithm. Apply Huffman coding for following message ensemble using binary digits for source code. **[8]**

[x]	X1	X2	X3	X4	X5	X6	X7	X8
[p]	1/4	1/4	1/16	1/16	1/8	1/8	1/16	1/16

b) Explain in detail quantizatioin process in image compression. **[8]**

Q8) Write short notes [any two] **[18]**

a) PN code properties.

b) B/W and color TV standard

c) DCT in image compression

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Total No. of Questions : 10]

SEAT No. :

P3429

[Total No. of Pages : 3

[4660]-339
M.E. (E / TC) (Communication Networks)
MODELLING AND SIMULATION OF COMMUNICATION NETWORKS
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) With suitable example compare deterministic and stochastic simulations. **[10]**

b) Elaborate various methodologies used in modeling of individual blocks of a problem into a simulation model. **[8]**

Q2) a) What are the aspects for selection of sampling frequency for a simulation? Hence explain up sampling and down sampling with suitable example.**[8]**

b) Why uniformly distributed random numbers generators are needed in simulation of communication systems? Hence explain Mixed congruence algorithm to generate uniformly distributed random numbers.. **[8]**

Q3) a) What are the various techniques to test random number generators? Explain any one in detail. **[6]**

b) What are the different methods to map uniform random variables to an arbitrary pdf? Explain in detail Inverse Transform Method. **[10]**

P.T.O.

Q4) a) What are PN sequence generators? Why do we need them? What are the components of a PN sequence generator? What are properites of a PN sequence? **[8]**

b) Illustrate any one of the graphical techniques used in typical simulation post processor. Demonstrate it with reference to $\pi/4$ DQPSK system.**[8]**

Q5) a) Enlist different techniques to generate correlated Gaussian numbers. Explain an algorithm to establish a pdf and a PSD (Sondhi Algorithm).**[10]**

b) What is effect of fixed point and floating point arithmetic on quantization error? **[6]**

SECTION - II

Q6) a) Describe the situations when one will choose one of the following estimation routines based on the data generated by simulation process:**[6]**

i) Histogram

ii) PSD

iii) Gain, Delay and Signal-to-Noise Ratio

b) Write an algorithm for simple Monte Carlo simulation for QPSK. Assuming AWGN channel, Data symbols at source output are independent and equally probable and No pulse shaping performed at transmitter.**[12]**

Q7) a) Write an algorithm to estimate value of π using Monte Carlo estimation.**[8]**

b) What is semi analytic simulation technique? Hence write an algorithm for semi analytic BER estimation for BPSK. **[8]**

Q8) a) Explain Saleh's quadrature model for nonlinearity with memory. **[8]**

b) Explain discrete multipath channel and diffused multipath channel with reference to multipath fading channel. **[8]**

Q9) a) What is tapped delay line model for LTV system? How various tap gains are generated? **[8]**

b) Explain tapped delay line model for simulation of discrete multipath fading channels. **[8]**

Q10) a) Explain two state Markov model for discrete channel with memory. **[8]**

b) Demonstrate valid and invalid uses of tail extrapolation. **[8]**

Total No. of Questions : 6]

SEAT No. :

P3331

[Total No. of Pages : 2

[4660]-340

M.E. (E&TC) (Communication Network)

MICROWAVE AND ANTENNA THEORY

(2008 Revised Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Draw the schematic diagram for n-type GaAs diode and explain the Gunn Effect and Gunn Diode Principle. **[8]**

b) Explain the various modes of Gunn Diode operations with relevant diagrams. **[8]**

c) How can you use circulator as an isolator? Explain with illustrative diagrams and scattering parameters. **[9]**

Q2) a) Draw the schematic diagram of physical structure of GaAs MESFET and explain its principle of operation in detail. Also draw its small signal equivalent circuit and explain the intrinsic and extrinsic parameters of the same. **[20]**

b) Compare the performance characteristics of HEMT, GaAs MESFET with respect to frequency, Noise, Power and speed. **[5]**

Q3) a) Explain the thin film and thick film technologies with respect to MMICs fabrication and compare both. **[15]**

b) What are the slow wave structures and how they are used in TWT? Explain with the principle and illustrative diagrams. **[10]**

P.T.O.

SECTION - II

Q4) A four cavity 'Klystron VA-828 has the following parameters Beam voltage : V_0=14.5kV, Beam current, I_0 = 1.4A, operating frequency f = 10 GHz, DC electron charge density $\rho_o = 10^{-6} C/m^3$, RF charge density $\rho_o = 10^{-8} C/m^3$. Velocity of perturbation $V = 10^5$ m/s, then compute the dec electron velocity, the dc phase constant, the plasma frequency, the reduced plasma frequency for R = 0.4, the dc beam current density, the instantaneous beam current density. **[25]**

Q5) a) Design rectangular micro strip antenna using substrate with dielectric with constant of 2.2, h = 0.1588cm, so as to resonate ate 10 GHz. Give the design procedure. **[10]**

b) Enlist various feeding techniques in micro strip antenna and explain each with illustrative diagrams and compare. **[15]**

Q6) Write a detailed note on the following antenna with structural details, dimensions, design specifications, equations, applications and limitations also compare in terms of the antenna parameters. **[25]**

a) Horn Antenna

b) Parabolic Reflector

c) Lens Antenna

d) Linear Array

e) Phased Array

Total No. of Questions : 10]

SEAT No. :

P2807

[Total No. of Pages :2

[4660]-341
M.E. (E & TC)(CN)
b-SIGNAL DETECTION AND ESTIMATION
(Semester-I) (2008 Revised Course) (Elective-I) (504603)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Question No.1 and 6 are compulsory. Out of the remaining attempt 2 questions from section I and 2 questions from section II.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Define stochastic process and explain it with any one example. **[5]**

b) Briefly explain Hypothesis and M-ary Hypothesis testing. What are the objectives of parameter estimation. **[8]**

c) Write short note on efficiency of Gauss- Markov model. **[5]**

Q2) a) Explain GAUSS-MARKOV model with suitable example. **[8]**

b) Consider the problem where the observed samples are $Y_k = M + N_k$ where k=1,2,...N. M and N are statistically independent Guassian random variable with zero mean and variance σ^2. Find minimum mean square estimate. **[8]**

Q3) a) Write a note on CFAR detection. **[8]**

b) Explain Detection of known signals in white noise with the help of correlation receiver. **[4]**

c) What are the properties of Estimators? **[4]**

Q4) a) Compare Linear MMSE estimation technique with Maximum Likelihood technique. **[8]**

b) What is null hypothesis and what are the various methods of hypothesis testing? **[8]**

P.T.O

Q5) a) Explain multiple and composite hypothesis system with respect to degree of freedom. **[8]**

b) Describe the rake receiver with suitable sketch. **[8]**

SECTION-II

Q6) a) What is Baye's criteria? Derive the expression for Baye's decision rule. Under what condition Baye's Criteria reduces to LRT and MAP. **[10]**

b) Explain properties of Linear Prediction Error Filter. **[8]**

Q7) a) Explain Kalman Filter in context of estimation of nonstationary processes. **[8]**

b) Explain estimation of Random and Nonrandom parameter. **[8]**

Q8) a) Explain the forward and backward linear prediction techniques. **[8]**

b) Discuss the performance of Weiner filter for filtering and prediction applications. **[8]**

Q9) a) Explain relation between Weiner and Kalman Filter. **[8]**

b) Derive the mathematical model of optimum linear filter. **[8]**

Q10)a) How estimation techniques can be useful for the RADAR signal processing? **[6]**

b) Write a note on AR lattice and ARMA lattice ladder filter. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P2808

[Total No. of Pages :2

[4660]-342
M.E. (E & TC)(CN)
C: ADHOC NETWORKS
(Semester-I) (2008 Course) (Elective-I) (504603)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Differentiate between cellular network and adhoc wireless network. **[9]**

b) Draw the schematic diagram for adhoc wireless Internet. What are the considerations for successful adhoc wireless Internet. **[9]**

Q2) Explain the following Routing Protocols. **[16]**

a) Fisheye state Routing protocol.

b) Zone based link state Routing Protocol.

Q3) a) What are the design issues of multicast routing protocol for adhoc wireless network? **[8]**

b) Explain the architecture of multicast routing protocol with the help of reference model. **[8]**

Q4) a) Explain why TCP does not perform well in adhoc wireless network. **[8]**

b) Explain the application controlled transport protocol (ACTP). **[8]**

P.T.O

SECTION-II

Q5) a) What is the need of power management for adhoc wireless network. Explain the process power management? **[9]**

b) Explain any one battery scheduling techniques? **[9]**

Q6) a) Explain how network security requirements vary in the following applications scenarios of adhoc wireless network. **[8]**

i) Home network
ii) Classroom networks
iii) Emergency search and rescue networks
iv) Military networks.

b) List and explain how some of the inherent properties adhoc wireless network introduce difficulties while implementing security in routing protocols. **[8]**

Q7) a) Explain how real time traffic is supported in adhoc wireless network.**[8]**

b) Explain the QoS enabled on demand distance vector Routing protocol (AODV). **[8]**

Q8) a) What are the challenges in providing QoS support in adhoc wireless network. **[8]**

b) Explain the classification of QoS solutions. **[8]**

□□□□

Total No. of Questions : 10]

SEAT No. :

P2809

[Total No. of Pages :2

[4660]-345
M.E. (E & TC) (Communication Networks)
C: COMPUTATIONAL ELECTROMAGNETICS
(Semester-I) (2008 Course) (Elective-II) (504604)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from section I and any three questions from section II.***
2) ***Question No.5 and 10 are compulsory.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be draw wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data if necessary.***

SECTION-I

Q1) a) Explain with suitable equations the power radiated by an uniform electromagnetic wave in free space. **[12]**

b) What is poynting theorem and its significance. **[4]**

Q2) A 20cm long metallic conductor of 1mm radius is maintained at a potential of 1v cylindrical and $\sigma = 4*10^7$ S/cm. Determine the charge distribution along the conductor using Method of Moments. **[16]**

Q3) Derive the Maxwell's equations for static fields.

Given $E=E_m e^{j(wt+\beta z)} a_x$ A/m in free space. Find H. **[16]**

Q4) a) Compare FEM and FDM and MoM based on various parameters. **[12]**

b) Discuss various hybrid computational methods. **[4]**

P.T.O

Q5) Write short note on any two: **[18]**

a) Finite Difference Time Domain.

b) Time domain modeling of electromechanical devices.

c) Need of computational electromagnetics.

SECTION-II

Q6) a) Comment on the accuracy and stability consideration of Yee-FDTD algorithm. **[10]**

b) What is the advantage of using triangular mask in FEM? **[6]**

Q7) a) Obtain wave equations for an electromagnetic in free space in terms of magnetic Field. [**10]**

b) Write the expression of Poisson's Equation and its significance. **[6]**

Q8) a) Explain in detail about Green's function. **[6]**

b) Explain FEM analysis and its application with suitable example. **[10]**

Q9) Using MoM, derive the expression for field distribution using integral form of potential equations. **[16]**

Q10) Write note on any two: **[18]**

a) Low frequency applications.

b) Laplace equations.

c) Significance of mask in FDTD.

□□□□

Total No. of Questions : 8]

SEAT No. :

P2810

[Total No. of Pages : 2

[4660] - 346

M.E. (E & TC) (Communication Networks)

WIRED & WIRELESS NETWORKS

(2008 Pattern) (Semester - II) (504607)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) State & explain four basic network topologies and write advantages of each type. **[8]**

b) Explain the following: **[8]**

i) 1-persistant CSMA

ii) Non-persistant CSMA

iii) P-presistant CSMA

Q2) a) Explain the function of bridges and routers in networks and on which layers bridges and routers are used? **[8]**

b) Explain TCP/IP model with protocols at each layer. **[8]**

Q3) a) How does token ring LAN operate? **[8]**

b) Explain basic structure of STS-1 SONET frame. **[8]**

Q4) a) Show the format of typical IP datagram header and explain it. **[9]**

b) i) What is socket? Explain it.

ii) What is socket address? Explain.

[9]

P.T.O.

SECTION - II

Q5) a) What are different static Routing algorithms? Explain any one in detail. **[8]**

b) What is network programming? Explain in brief. **[8]**

Q6) a) What is NAT? How can NAT help in address depletion? **[8]**

b) What is VLAN? How it is work? **[8]**

Q7) a) Compare between IPV4 and IPV6. **[8]**

b) Explain Go Back-N ARQ protocol and selective repeat ARQ protocol. **[8]**

Q8) a) An address in block is given is 167.199.170.82/27. Find the class of address, the number of addresses in block, the first address and the last address. **[9]**

b) Briefly define subnetting. How do the subnet mask differ from a default mask in classful addressing? **[9]**

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Total No. of Questions : 8]

SEAT No. :

P2811

[Total No. of Pages :2

[4660]-347
M.E. (E & TC) (Communication Networks)
NETWORK TRAFFIC ANALYSIS AND QoS
(2008 Course)(Semester-II) (504608)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to right indicates full marks.***
5) ***Use of electronic calculator is allowed.***

SECTION-I

Q1) a) Explain credit based flow control for ATM networks. **[10]**

b) What is flow based and class based QoS models? Explain in brief. **[8]**

Q2) a) Explain the technique of token bucket with the help of neat diagram. **[8]**

b) Explain the use of flow control in congestion for ATM networks. **[8]**

Q3) a) Describe briefly the different traffic models. **[8]**

b) A link of capacity 155mbps serves sources that have Peak rate of 15.5 mbps and peak to average ratio r. How many calls can be admitted with peak rate and average rate allocation? **[8]**

Q4) a) What is QoS? Explain with neat diagram QoS architecture. **[8]**

b) Explain in brief RSVP. **[8]**

P.T.O

SECTION-II

Q5) a) Explain the different approaches of streaming stored audio/video files. **[8]**

b) Draw and explain diagram of real time multimedia system. **[8]**

Q6) a) Examine the concept of network security from LAN and WAN perspective. **[8]**

b) Describe concept of Virtual Private Network. Why security is concern when using a VPN. **[8]**

Q7) a) What is NMS? Describe the goals and functions of NMS. **[8]**

b) What are challenges faced by network administrators. **[8]**

Q8) Write short notes on: **[18]**

a) Integrated services.

b) Video conferencing.

c) Traffic management in high speed networks.

□□□□

Total No. of Questions : 8]

SEAT No. :

P2812

[Total No. of Pages :2

[4660]-348
M.E. (E & TC) (Communication Network)
WIRELESS SYSTEM DESIGN
(Semester-II) (2008 Course) (504609)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) What is magnitude and phase angle of reflection coefficient under following conditions, **[8]**

i) Open circuit ii) Short circuit

iii) Matched load iv) Resistive load

v) Pure reactive load and vi) General case of load

b) Derive phase velocity expression in terms of L & C. Also describe relation between bandwidth and phase velocity. **[8]**

Q2) a) What is Roulette Stability factor? Write its equation and explain potentially unstable condition. **[8]**

b) Derive equation of power produced by source, under perfect matched condition in RF amplifier. **[8]**

Q3) a) What do you mean by instability of RF amplifier? Write condition of instability in terms of reflection coefficient. **[8]**

b) What is constant gain circle in RF amplifier? Write normalized gain equation. **[8]**

P.T.O

Q4) a) Draw and describe quartz crystal oscillator. Also write equation of oscillating frequency. What is approximate resonant frequency if thickness of the quartz slab is 2mm? **[9]**

b) What do you mean by fixed frequency oscillator? How to reduce attenuation in basic LC oscillator? **[9]**

SECTION-II

Q5) a) What is condition of transconductance to start oscillations in Colpitts oscillator?

If n=0.155 and R=850Ω, Calculate transconductance value. **[8]**

b) What are limitations of quartz crystal at high frequency? What is a SAW device and how does it overcomes limitations of quartz crystal at high frequency? **[8]**

Q6) a) Explain fundamental multiplication in a mixer. Explain the term, 'nonlinear system as a linear mixer'. **[8]**

b) Explain characteristics of mixer linearity parameters of mixer. **[8]**

Q7) a) Draw and describe common gate RF Transconductor circuit for mixer. What are disadvantages of it? [**8]**

b) Compare single balanced and double balanced mixers. **[8]**

Q8) Write note on any three, **[18]**

a) Passive double balanced mixer.

b) Performance degradation due to RF components.

c) YIG tuned oscillator.

d) Isolation in mixer.

□□□□

Total No. of Questions : 8]

SEAT No. :

P2813

[Total No. of Pages :2

[4660]-349
M.E. (E & TC) (Communication Networks)
a: WIRELESS SENSOR NETWORK
(2008 Course) (Elective-III) (504610)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain the components of Wireless Sensor Network System. **[8]**

b) Explain the application of Wireless sensor network in health care with neat diagram. **[8]**

Q2) a) Explain various wireless data networks. **[8]**

b) Explain wireless sensor and related networks. **[8]**

Q3) a) Draw & explain practical physical layer for wireless sensor networks. **[8]**

b) What are the different medium access control techniques? Explain any one in detail. **[8]**

Q4) Write short note any three of the following: **[18]**

a) Mediation device.

b) Network performance objectives.

c) Applications of Wireless Sensor Networks.

d) Cluster Tree Architecture.

P.T.O

SECTION-II

Q5) a) What are the practical implementation issues in Wireless Sensor Networks? **[8]**

b) Explain in detail partitioning decision and transducer interfaces. **[8]**

Q6) a) What are the effects of ESD on Integrated Circuits Modeling and Test standards. **[8]**

b) What is Electromagnetic Compatibility? What are the principles of proper layout? **[8]**

Q7) a) Explain RF performance and measurement in detail. **[8]**

b) Explain product Design to Minimize ESD problems. **[8]**

Q8) Write short note on any three of the following: **[18]**

a) The Zig-Bee Alliance.

b) Power Management Strategy.

c) Wireless Sensor Network Standards.

d) Transducer Interface Standard.

□□□□

Total No. of Questions : 8]

SEAT No. :

P2814

[Total No. of Pages :2

[4660]-350
M.E. (E & TC) (Communication Network)
b: MOBILE COMPUTING
(Semester-II) (2008 Course) (Elective-III) (504610)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to right indicate full marks.***

SECTION-I

Q1) a) Discuss the evolution of 1G to 4G Mobile Technologies. **[8]**

b) Discuss, how security is addressed in GSM? **[8]**

Q2) a) Explain GPRS transmission protocol architecture. **[8]**

b) Explain IEEE 802.16 Wi-Max Technology. **[8]**

Q3) a) Explain the fundamentals of wireless markup language and WML script applications. **[8]**

b) Discuss the value added services in 3G Mobile Technology. **[8]**

Q4) Write notes on: **[18]**

a) Bluetooth.

b) VOIP architecture.

SECTION-II

Q5) a) What is mobile computing environment? Explain three tier architecture for the same. **[8]**

b) Discuss, typical case studies for secure mobile application development. **[8]**

P.T.O

Q6) a) Explain basic location tracking and call set up mechanism in GSM system. **[8]**

b) Discuss GSM signal processing operation with necessary block diagram. **[8]**

Q7) a) Explain MIMO systems and concept of Spatial Multiplexing. **[8]**

b) Discuss the various issues considered in designing the WLAN environment. **[8]**

Q8) Write notes on: **[18]**

a) 802.11 Wi-Fi Technology.

b) CDMA 2000.

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Total No. of Questions : 8]

SEAT No. :

P2815

[Total No. of Pages :2

[4660]-353
M.E. (E & TC)(Communication Networks)
b:NEURAL NETWORKS IN COMMUNICATION
(2008 Course) (Semester-II) (Elective-IV) (504611)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Draw and explain the McCulloch -pitts neuron architecture. Generate the output of OR logic function using McCulloch-pitts neuron. **[10]**

b) Derive the Hebbian and the perceptron learning rule. **[8]**

Q2) a) Explain the architecture of perceptron network used for the pattern classification describe the algorithm used for training of the perceptron net. **[8]**

b) Describe the concept of the linear separability. Explain in detail how is boundary region (decision boundary) determined using linear separability concept. **[8]**

Q3) a) Develop a perceptron for the AND function with bipolar inputs and targets. **[8]**

b) Describe in detail the problem of congestion control in packet switching networks. How this problem can be solved using the neural networks? **[8]**

Q4) a) With architecture describe the training procedure adopted for neocognitron net. **[8]**

b) Explain in detail how the static and dynamic channel assignment can be done using simulated annealing. **[8]**

P.T.O

SECTION-II

Q5) a) What is back propagation network? Describe in detail the training algorithm used in the back propagation network. Comment on the selection of parameters used in training. **[8]**

b) Describe in detail the applications of neural network in Telecommunications. **[8]**

Q6) a) Discuss in detail Automatic language identification using telephone speech. **[8]**

b) Discuss the basic architecture and operation of Adaptive Resonance Theory (ART) network. **[8]**

Q7) a) Why self organizing neural net is called the topology preserving maps? With architecture, explain the training algorithm used in kohonen self organizing feature map. **[8]**

b) A hetero associative net is trained by Hebb outer product rule for input row vectors: **[8]**

$S=(X_1,X_2,X_3,X_4)$ to output row vectors t=(p1,p2). Find the weight matrix.

$S_1 = (1100) \quad t_1 = (1\,0)$

$S_2 = (1110) \quad t_2 = (01)$

$S_3 = (0011) \quad t_3 = (10)$

$S_4 = (0100) \quad t_4 = (10)$

Q8) Write short notes on (ANY THREE): **[18]**

a) Optical neural network.

b) Feedback networks.

c) Support vector machine.

d) ATM traffic control using ANN.

e) Generalization ability of neural network.

□□□□

Total No. of Questions : 8]

SEAT No. :

P2816

[Total No. of Pages : 2

[4660]-355
M.E. (Electronics) (Digital Systems)
MICROELECTRONICS
(504195) (2008 Course) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicates full marks.***
3) ***Assume suitable data wherever necessary.***

SECTION-I

Q1) a) Explain the voltage Transfer characteristics (VTC) of CMOS inverter. Clearly label the VTC indicating operating region (cut-off, linear, saturation) of the transistors. **[10]**

b) With the help of detailed equivalent circuit diagram explain parasitic capacitances involved in a MOSFET. **[6]**

Q2) a) Design 4:1 multiplexer using transmission gate and conventional CMOS logic. Compare these schematics with respect to speed, power and area. **[8]**

b) Derive the expression for static and dynamic power dissipation in CMOS logic circuit. **[8]**

Q3) a) For the boolean expression $F=\overline{AB+C(A+B)}$. **[10]**

i) Design and draw static CMOS circuit.

ii) Draw its stick diagram.

iii) Draw its layout.

iv) Calculate the area required for the circuit.

b) What is Domino logic? Explain the difference between Domino logic and NORA logic. **[6]**

P.T.O.

Q4) Write short note on the following (Any Three): **[18]**

a) Layout design rules.

b) Ultra fast VLSI circuits and materials used.

c) Technology scaling.

d) Mixed signal design issues.

SECTION-II

Q5) a) Explain MOS implementation of current sink and current source alongwith their V-I characteristics. **[8]**

b) What is the necessity of MOS diode/active resistor? Draw the MOS diode/active circuits for nMOS and pMOS transistors and explain using I-V characteristics and small signal model. **[8]**

Q6) a) Draw state diagram of 8-bit up/down counter and write its VHDL code using FSM. **[8]**

b) What are configurations? How configuration is written, explain with suitable VHDL program? **[8]**

Q7) a) Explain the following terminologies with respect to VHDL. **[8]**

i) Subprograms.

ii) Attributes.

iii) Data objects.

iv) Packages.

b) Draw the circuit diagram of 4:1 multiplexer using two 2:1 multiplexers and write its VHDL code using structural modeling. Also write the VHDL code for the components declared in the program as separate entities. **[8]**

Q8) Write short note on the following (Any Three): **[18]**

a) I/O architectures.

b) Signal integrity issues.

c) Floor planning methods.

d) Off chip connections.

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Total No. of Questions : 8]

SEAT No. :

P2818

[Total No. of Pages : 2

[4660]-357
M.E. (Electronics) (Digital Systems)
SIGNAL PROCESSING ARCHITECTURE
(504196) (2008 Course) (Revised Course) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data wherever required.***
5) ***Figures to the right indicate full marks.***

SECTION-I

Q1) a) What is FFT? Explain the decimation in time FFT algorithm. Explain how the number of computations is reduced using FFT algorithm. **[8]**

b) What is real time linear filtering? Explain the overlap and add algorithm to implement real time filtering. Explain a block schematic for use of FFT for linear filtering. **[10]**

Q2) a) What is windowing? Explain Gibbs phenomenon. How will you reduce the effect of Gibbs phenomenon? **[8]**

b) Find the coefficients of FIR HPF that has a pass band between 1000 Hz to 4000 Hz using Fourier Series expansion method. The duration of the response is limited to 2.5ms. Sampling frequency is 8000 Hz. **[8]**

Q3) a) What is pipelining? How pipelining improves the throughput of the system? Explain the use of unfolding transformation. **[8]**

b) What is a step size? Explain the effect of step size on quantization noise. Explain the effect of quantization of input samples. **[8]**

Q4) a) What is DCT? Does it give energy compaction and decorrelation? Compare its performance with DST. **[8]**

b) Explain the Bilinear transformation method for IIR filter design? What is frequency warping effect? **[8]**

P.T.O.

SECTION-II

Q5) a) Explain time and frequency analysis using wavelet domain. Explain the use of Haar wavelet. **[8]**

b) What is a basis function in case of DFT? How the basis function gets modified in case of STFT? Explain the criterion for selection of window size. **[8]**

Q6) a) Explain the booth multiplier algorithm with the help of a suitable example. **[8]**

b) Explain the use of program cache in super Harvard architecture. What is a circular buffer? Explain its operation. **[8]**

Q7) a) Explain the efficient implementation of the decimator and interpolator. What is the meaning of poly phase filter? **[8]**

b) Find the specifications of the filters in a two stage interpolator to increase the sampling frequency from 128 KHz to 1024 KHz. The band of interest is 0 to 60 KHz. **[10]**

Q8) a) Explain the use of multiport memory. Explain the use of modified bus structure in TMS 320C6713? **[8]**

b) Explain the use of code composer studio. What are the facilities available in code composer studio? **[8]**

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Total No. of Questions : 8]

SEAT No. :

P2819

[Total No. of Pages : 2

[4660]-358
M.E. (Electronics) (Digital Systems)
a-FAULT TOLERANT SYSTEM DESIGN
(504197) (2008 Course) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain in detail the Binary Decision diagram. **[8]**

b) Explain the concept of unknown logic value and construct a Truth table for the following gates using 3-valued logic. **[10]**

i) AND gate ii) OR gate

iii) NOT gate iv) NAND gate

Q2) Write short notes on: **[16]**

a) Fault coverage.

b) Hazards.

c) Fault equivalence.

d) Fault Dominance.

Q3) a) For the circuit shown below in fig. (1). Find the set of all tests that detects the fault c $\rightarrow$ s-a-1 and a $\rightarrow$ s-a-1. **[8]**

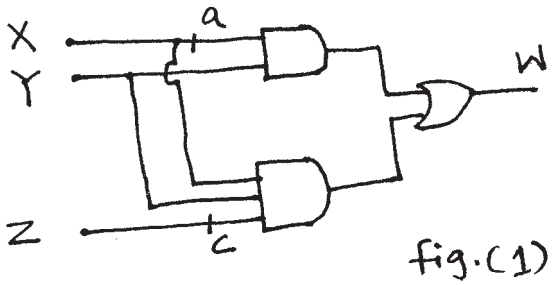

fig.(1)

P.T.O.

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

i) Path sensitization D-algorithm.

ii) Bridging fault model.

Q4) a) Draw a circuit that has an undetectable stuck fault. It is possible to have a combinational Circuit 'C' with some signal 'S' and test 't' such that t detects both S $\rightarrow$ s-a-1 and S $\rightarrow$ s-a-0? **[8]**

b) Explain fault equivalence. Prove that two faults f and g are equivalent if and only if Zf(x) = Zg(x). **[8]**

SECTION-II

Q5) a) Explain in detail the process and different types of Logic Simulation techniques. **[12]**

b) Explain the use of Fault simulation in Test generation. **[6]**

Q6) a) Explain in detail the Ad-Hoc design for Testability techniques. **[8]**

b) Explain Controllability and Observability by means of a Scan Register. **[8]**

Q7) a) Classify compressing techniques used for testing. Explain any one technique in detail. **[8]**

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

i) PLA testing.

ii) Self checking testing for fault detection.

Q8) a) What is Boundary Scan? Show a design for the boundary-Scan cell circuitary for a Bidirectional I/O pin in the IEEE 1149.1 methodology. **[8]**

b) Explain in detail Path Oriented Decision making algorithm. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P2820

[Total No. of Pages : 2

[4660]-360
M.E. (Electronics-Digital Systems)
c-WIRELESS & MOBILE TECHNOLOGIES
(504197) (2008 Pattern) (Elective-I) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Compare between connectionless and connection oriented communication. **[8]**

b) What are the general problems of mobile IP regarding security and support of quality of service? **[8]**

Q2) a) Name the main elements of the GSM system architecture and describe their functions. **[8]**

b) Explain the collision detection and collision avoidance in detail. **[8]**

Q3) a) Discuss in detail the request-to-send/ clear-to-send (RTS/CTS) mechanism. **[8]**

b) Explain the control channels in GSM. **[8]**

Q4) Write short notes on Any Three: **[18]**

a) WLAN security levels and issues.

b) Dynamic host configuration protocol.

c) Wireless application protocol architecture.

d) Mobile ad-hoc networks.

P.T.O.

SECTION-II

Q5) a) Explain the routing in multi-hop ad-hoc networks. What are its challenges? **[8]**

b) Compare remote and self positioning systems? **[8]**

Q6) a) If the transmitter and receiver in WLAN operating at 2.4 GHz are separated by a distance of 50m, and the power transmitted by transmitter is 10 dBm, what is received power considering free space propagation and omini directional antennas at both ends. **[8]**

b) Show the interaction of mobile IP with standard TCP. Draw the packet flow from a fixed host to mobile host via a foreign agent. **[8]**

Q7) a) How does GSM convert 456 bits of the speech, data or control signal into a normal burst of 156.25 bits. Explain. **[8]**

b) What is basic purpose of DCP? Name the entities of DHCP. **[8]**

Q8) Write short notes on Any Three: **[18]**

a) Interaction of Mobile IP with standard TCP.

b) Compare IEEE 802.11 and HIPER LAN2.

c) Mobile TCP.

d) Compare CDMA and TDMA.

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Total No. of Questions : 8]

SEAT No. :

P2821

[Total No. of Pages : 2

[4660]-361
M.E. (Electronics) (Digital Systems)
a-MACHINE INTELLIGENCE
(504198) (2008 Course) (Elective-II) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answere 3 questions from Section-I and 3 questions from Section-II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right side indicate full marks.***

SECTION-I

Q1) a) Explain the difference between fuzzy set and classical set. Explain any two fuzzy operations. **[10]**

b) Sketch and define the following membership functions mathematically. **[6]**

i) Bell shaped Membership function.

ii) Trapezoidal Membership function.

Q2) a) Explain fuzzy Cartesian product with suitable example. **[8]**

b) Explain fuzzy composition. **[8]**

Q3) a) Explain Centroid based defuzzification method. **[8]**

b) Explain the difference between Sugeno and Mamdani fuzzy inference system. **[10]**

Q4) a) Explain Tsukamoto fuzzy inference system with block diagram. **[8]**

b) Describe least squares method for system identification. **[8]**

P.T.O.

SECTION-II

Q5) Design two input 'AND' gate using perceptron Algorithm. Asume initial weights and bias as 0.3. Learning rate as 0.5. Show weight upadation upto 4 iterations. Implement the same using Adaline Algorithm. **[16]**

Q6) Explain architecture of RBF in detail with the training algorithm. Also explain various RBF functions. **[16]**

Q7) a) Explain the difference between McCulloch-Pitts, Perceptron and Adaline model with weight updation equations. **[8]**

b) Explain how multilayer perceptron can be used to solve XOR problem. **[8]**

Q8) Write notes on: **[18]**

a) ANFIS.

b) Multilayer Network.

c) SOM.

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Total No. of Questions : 8]

SEAT No. :

P2822

[Total No. of Pages : 3

[4660]-362
M.E. (Electronics)
b-ADVANCED COMPUTING ARCHITECTURES
(504198) (2008 Pattern) (Semester-I) (Elective-II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain SIMD architecture. **[8]**

b) Distinguish between multiprocessor and multicomputer based on their structures, interprocessor communications. Also, explain the differences among UMA, NUMA and CDMA computers. **[8]**

Q2) a) Explain how instruction set, compiler technology, CPU implementation and control, cache and memory hierarchy affect the CPU performance. Justify the effects in terms of program length, clock rate and effective CPI. **[8]**

b) Describe inclusion, coherence properties of memory hierarchy. **[8]**

Q3) a) Consider the execution of an object code with 2,00,000 instructions on 40 MHz processor. The instruction mix and number of cycles (CPI) needed for each instruction type are given below based on the result of program trace experiment.

P.T.O.

Instruction Type	CPI	Instruction mix
Arithmetic and logic	1	60%
Load/store with cache hit	2	18%
Branch	4	12%
Memory reference with cache miss	8	10%

i) Calculate the average CPI when the program is executed on a microprocessor with the above trace results.

ii) Calculate corresponding MIPS rate based on the CPI obtained in (i). **[8]**

b) Briefly explain two basic approaches used to minimise register-memory operations on RISC machines. **[8]**

Q4) a) Explain the following concepts with respect to virtual memory models: **[10]**

i) Address space

ii) Address mapping

iii) Private virtual memory

iv) Shared virtual memory.

b) Distinguish between medium-grain and fine-grain multicomputers with respect to their architectures and programming requirements. **[8]**

SECTION-II

Q5) a) Explain temporal locality, spatial locality and sequential locality associated with program/data access in memory hierarchy. **[8]**

b) Distinguish between numeric processing and symbolic processing computers interms of data objects, common operations, memory requirement, communication patterns, algorithmic properties, I/O requirements and processor architecture. **[8]**

Q6) a) Explain the physical address cache versus virtual address cache associated with cache and memory architecture. **[8]**

b) Explain the terms reservation tables and latency analysis associated with nonlinear pipeline processors. **[8]**

Q7) a) What is instruction pipeline, explain following mechanisms for instruction pipeline. **[8]**

i) Pre-fetch buffers.

ii) Multiple functional unit.

iii) Internal data forwarding.

b) Explain various issues in vector processing. **[8]**

Q8) a) Explain the structures and operational requirements of the instruction pipelines used in CISC, RISC processors. **[10]**

b) Write note on Any Two: **[8]**

i) SIMD parallel algorithm.

ii) Dynamic instruction scheduling.

iii) VLIW architecture.

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Total No. of Questions : 10]

SEAT No. :

P2823

[Total No. of Pages : 2

[4660]-363
M.E. (Electronics) (Digital System)
c-MEMORY TECHNOLOGIES
(504198) (2008 Pattern) (Elective-II) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) What are the parameters which should be taken into account while designing SRAMs? **[8]**

b) Draw the various SRAM cell structures. Explain them for various operations. **[8]**

Q2) a) Draw the typical functional diagram for- **[8]**

i) Nonvolatile SRAMs.

ii) CAM.

b) What are the advantages of STC? **[8]**

Q3) a) Explain the various stages of soft-error creation by an alpha particle hit in a DRAM with necessary sketches. **[8]**

b) What are the characteristics of ideal nonvolatile memories? **[8]**

Q4) a) Explain Floating Gate Tunneling Oxide Technology (FLOTOX). **[8]**

b) Explain concept of March test with suitable algorithm. **[8]**

P.T.O.

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

a) SONOS.

b) Trench Capacitor.

c) Coupling faults.

d) Embedded DRAM fault Modeling and Testing.

e) Antifuse.

SECTION-II

Q6) a) Draw and explain typical bathtub curve for semiconductor memories. **[8]**

b) What are the Dielectric-Related Failures for RAM and discuss its solutions. **[8]**

Q7) a) What is radiation hardening? Discuss Problems caused by radiation. **[8]**

b) Explain Single-Event Upsets (SEU). **[8]**

Q8) a) What are the advantages and disadvantages of the FRAM? **[8]**

b) Compare MRAM, SRAM, DRAM, EEPROM and FRAM. **[8]**

Q9) a) What do mean by memory hybrids? What are the applications of these? **[8]**

b) List the different memory cards available in the market from different vendors. **[8]**

Q10) Write short note on (Any Three): **[18]**

a) Electromigration.

b) Reliability issues of flash memories.

c) Radiation effects on electronics.

d) Single-Electron Memory.

e) Memory Cards.

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Total No. of Questions : 8]

SEAT No. :

P2824

[Total No. of Pages : 2

[4660]-364
M.E. (Electronics) (Digital Systems)
EMBEDDED SYSTEMS
(504201) (2008 Course) (Semester-II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written separately.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Neat diagram must be drawn whenever necessary.***

SECTION-I

Q1) a) Describe the various design metrics used for embedded system design. **[10]**

b) Describe and compare various programming technologies used in FPGA. **[8]**

Q2) a) Draw and describe the architecture of typical ARM-7 Processor. **[8]**

b) What are seven operating modes of the ARM 7 Processor? **[8]**

Q3) a) What are the issues related with signal integrity and differential signaling? **[8]**

b) Describe the various RISC architecture design rules. **[8]**

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

a) MODBUS Protocol,

b) IEEE 802.11 Protocol,

c) Boundary scan technique, and

d) CAN Bus.

P.T.O.

SECTION-II

Q5) a) Describe the various software architectures. **[12]**

b) Differentiate between Desktop OS and RTOS. **[6]**

Q6) a) Describe various Inter-process Communication techniques used in O.S.? **[10]**

b) Describe delay generation techniques used in RTOS. **[6]**

Q7) a) Describe the features of the µCOS-II RTOS. **[6]**

b) Describe the µCOS-II functions used to handle the semaphore. **[10]**

Q8) a) What features of the integrated development Environment (IDE) tool supports the development of an embedded system? **[8]**

b) Draw and describe µCOS-II states. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P3396

[Total No. of Pages : 2

[4660]-365
M.E. (Electronics) (Digital System)
COMMUNICATION NETWORK AND SECURITY
(504202) (2008 Course) (Semester-II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain with neat schematic the mobile IP system with reference to MN, FA, COA and HA. **[8]**

b) Explain in detail network layer importance in mobile IP system with reference to IP in IP encapsulation. **[8]**

Q2) a) Describe various issues involved in wireless communication? Discuss in detail Ad-Hoc networks. **[8]**

b) State and explain sequence steps involved in WLAN and Hand-Off. **[8]**

Q3) a) What are the major issues associated with MAC protocol in Ad-Hoc wireless network? **[8]**

b) Discuss wireless sensor network with the help of data dissemination and gathering. **[8]**

Q4) Write short notes on (Any Three): **[18]**

a) Reactive and Proactive routing.

b) Indirect TCP and Snooping TCP.

c) QOS in wireless network.

d) FRAME RELAY.

P.T.O.

SECTION-II

Q5) a) Discuss the properties and requirements of Digital Signature. Explain the Sequential steps of DSS algorithm. **[8]**

b) Explain the importance of IP Sec with suitable example. Distinguish IP Sec with HMAC Operation. **[8]**

Q6) a) Explain RSA algorithm. Generate public and secrete key for the following prime numbers P=3, Q=11 and consider E=5. State advantages of RSA over Diffie - Hellman algorithm. **[8]**

b) Explain in detail key compensation and client authentication of SSL and TSL protocol. **[8]**

Q7) a) Discuss the steps involved in DES and AES algorithm. **[8]**

b) State and explain various feature and operation steps involved in PGP. **[8]**

Q8) Write short notes on (Any Three): **[18]**

a) Electronic mail security.

b) S/MIME.

c) Secure Electronic Transaction.

d) IDEA symmetric key algorithm.

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Total No. of Questions : 8]

SEAT No. :

P2826

[Total No. of Pages :2

[4660] - 366
M.E (Electronics) (Digital System)
IMAGE PROCESSING AND PATTERN RECOGNITION
(2008 Course) (504203) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain Unsharp masking and High boost filtering. **[8]**

b) What is the drawback of Laplacian operator? Explain Laplacian of Gaussian operator in detail. **[8]**

Q2) a) What do you mean by image feature? Explain minimum three image features for pattern recognition? **[8]**

b) Explain the following terms: **[8]**

i) Probability of events

ii) Joint distribution and densities.

Q3) a) What is histogram equalization? Explain local and global histogram equalization technique? **[8]**

b) Explain syntactic pattern Recognition. **[8]**

P.T.O.

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

a) Independent component Analysis.

b) Sobel and prewitt edge detectors.

c) Moments of Random variables.

d) Adaptive decision boundaries.

SECTION - II

Q5) a) What is decision boundary? Explain the steps in adaptive decision boundary algorithm. **[8]**

b) What is image enhancement and how it is different from image restoration.

Explain in short following image enhancement techniques. **[8]**

i) Intensity level slicing.

ii) Power law transformation.

iii) Contrast stretching.

Q6) a) Explain Minimum risk estimators. **[8]**

b) Explain in detail the leaving one out technique for estimation of error rates. **[8]**

Q7) a) What is support vector machine? Give the steps in support vector machine for object Recognition. **[8]**

b) Explain the nearest neighbor classification algorithm with example. **[8]**

Q8) Write short notes on following (any three): **[18]**

a) Kernel and window estimators.

b) Back propagation algorithm.

c) Hierarchical clustering.

d) Template matching.

Total No. of Questions : 8]

SEAT No. :

P2827

[Total No. of Pages :2

[4660] - 367
M.E. (Electronics)
a - DIGITAL SYSTEMS USING PLDs
(2008 Course) (Elective - III) (Semester - II) (504204)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Question no 1 & 5 is compuslory and solve any two questions from question 2,3,4 and 6,7,8, from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume Sutiable data if necessary.***

SECTION - I

Q1) a) Compare CPLD and FPGA with respect to following terms:

i) Architecture ii) Size iii) Cost

iv) Memory v) Specification vi) Features **[12]**

b) Give the typical characteristics of multicontext FPGA, also give its merits. **[6]**

Q2) a) Explain SRAM and DRAM. **[8]**

b) What are various parameters to be consider while designing SRAM's. **[8]**

Q3) a) Explain the architecture of Virtex device. Comment on setup time and system frequency of the device. **[8]**

b) Explain the concept of ISP and JTAG controller in CPLD. **[8]**

Q4) Describe selection criteria of PLD. Design PLD based system for the following specification i) LED display ii) 8 bit DAC **[16]**

iii) Keyboard iv) LCD

P.T.O.

SECTION - II

Q5) a) Write VHDL code with FSM diagram for three step lift controller, give proper interface diagram. **[12]**

b) Discuss about Spartan 3 FPGA. **[6]**

Q6) a) Draw and explain the architecture of FPGA in detail. **[8]**

b) Design an interfacing circuit for generating square wave and write VHDL code for it. **[8]**

Q7) a) Classify the application specific integrated circuits (ASIC). Explain each in brief. **[8]**

b) Comment on area and power optimization of CPLD and FPGA. **[8]**

Q8) a) Explain in detail the Build in self testing architecture in a sequential circuit. **[8]**

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

i) Antifuse based FPGA

ii) DSP processor

Total No. of Questions : 8]

SEAT No. :

P2828

[Total No. of Pages :2

[4660] - 368
M.E (Electronics) (Digital Systems)
(b) BIOMEDICAL SIGNALS & SYSTEMS
(2008 Pattern) (504204) (Elective - III) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the objectives of Bio-medical signal analysis? What are the Difficulties encountered with acquisition and analysis of biomedical Signal? **[10]**

b) Draw a 3-channel schematic plot of simultaneous recording of the ECG, PCG, and carotid pulse signal for two cardiac cycles. Label the important waves in each signal and describe the related events in the cardiac cycle. Label the time axis with the typical duration durations of each wave. Identify the interrelated waves or markers in the three signals and the relationships to cardiac events that they share. **[8]**

Q2) a) Distinguish between ensemble averages and temporal (time) averages. Explain how you would apply synchronized averaging to remove noise in EMG signals. **[8]**

b) Give a signal x(t), give the definition of the time-averaged auto correlation function (ACF)$\Phi(\tau)$. Derive the relationship between the Fourier transform of x(t) and $\Phi(\tau)$. Show all steps of derivation. Provide an interpretation of your result. **[8]**

Q3) a) Compare between Time Domain filters and Frequency Domain filters and which are commonly used filter. **[8]**

b) Design a Butterworth low pass filter with Fc = 1.5 kHz, Fs = 10,000 samples/sec N = 2. **[8]**

P.T.O.

Q4) a) Explain different measures derived from PSD function. **[8]**

b) Develop a mechanical analog of the knee joint to model the generation of the pulse train related to physiological patello-femoral crepitus. **[8]**

SECTION - II

Q5) a) What is supervised pattern classification? Explain various supervised Algorithm. **[10]**

b) Propose a method to detect spike and wave complexes in an EEG signal. Give at least one equation and explain your approach. Give a step by step algorithm to implement your procedure. **[8]**

Q6) a) Suggest an approach to remove muscle contraction interference from knee Joint vibration signal. **[8]**

b) Consider a continuous - time sinusoidal signal of frequency 10Hz. Derive an analytical expression for the ACF of the signal. State the relationship of the PSD to the ACE. **[8]**

Q7) a) A biomedical signal is sampled at 500 Nn and subjected to AR modeling. The poles of the model are determined to be at 0.4 f j0.5 and –0.7 f j0.6 Derive the transfer function of the model. What are the resonance frequencies of the system that is producing the signal? **[8]**

b) Explain Homomorphic filtering for ECG Rhythm Analysis & identification of Heart sounds. **[8]**

Q8) a) For a signal sampled at fs = 200Hz, Design a notch filter to reject power line artifact at 50Hz. Use only one pair of zeros. Mention following in your solution. **[8]**

i) The pole-zero plot of the filter. Show the frequencies DC, 50Hz & 100Hz on the plot.

ii) The transfer function and impulse response of the filter.

b) Draw ECG wave form and give normal value of amplitude & duration of important ECG Parameter. Explain matched filter in detection of P wave. **[8]**

✦ ✦ ✦ ✦

Total No. of Questions : 8]

SEAT No. :

P2829

[Total No. of Pages :2

[4660] - 369
M.E (Electronics - Digital System)
c - EMBEDDED VIDEO PROCESSING
(2008 Course) (Elective - III) (Semester - II) (504204)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain in detail need and different video compression techniques. **[8]**

b) What are DC & AC coefficients in DCT computations? Is the procedure for encoding DC & AC coefficients same? Explain progressive & zigzag order scanning of values in RLE in 8 X 8 matrixes. **[8]**

Q2) What are the factors that can be exploited to reduce the computational complexity of block matching algorithm? Comment on the performance of fast block matching algorithm as compared to the full search method with suitable example. **[16]**

Q3) a) What is the role of SNR in defining the quality / quantity of image compression by the JPEG standard? Define other similar performance metrics that describe the compression process. **[8]**

b) What is GOP? Explain in detail encoding of various pictures in a GOP in MPEG-1? **[8]**

Q4) a) What are the techniques to obtain quantization table suggested in JPEG? Explain any one in detail. **[12]**

b) Compare RGB with YCbCr colour spaces. **[6]**

P.T.O.

SECTION - II

Q5) a) A frame in broadcast. T.V. has resolution of 720 X 480 with typical frame rate of 25 frames/sec. Evaluate the computational complexity for motion estimation when the algorithm used is : **[12]**

i) Full search

ii) Two dimensional logarithmic search

State clearly the assumptions made.

b) How the noise due to camera movement & camera noise is filtered by pre-filtering process? **[6]**

Q6) a) Compare H.261 with H.263. **[6]**

b) Compare full search with logarithmic search method. **[6]**

c) What is a co-processor? Explain its features in detail. **[4]**

Q7) a) For five symbols with their corresponding probabilities as given below A = 0.1, B = 0.15, C = 0.4, D = 0.25, E = 0.1 Calculate - Entropy (H) **[8]**

Build Huffman tree

Compute average code length

Code for BCCADE.

b) Explain three-level wavelet decomposition tree using neat schematic and write equation for continuous wavelet transform & explain the role of each term. **[8]**

Q8) Write notes on - (Any two): **[16]**

a) MPEG - 4

b) JPEG 2000

c) H.263

Total No. of Questions : 8]

SEAT No. :

P3480

[Total No. of Pages : 2

[4660] - 370

M.E. (Electronics) Digital System

RECONFIGURABLE COMPUTING

(2008 Pattern) (Elective - IV)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Draw and explain the architecture of DPGA. **[8]**

b) Explain Functional Density with an example. **[8]**

Q2) a) With neat diagram explain 4 - LUT processing elements of FPGA. **[8]**

b) State and explain reconfigurable device characteristics. **[8]**

Q3) a) Compare the Architecture of ASIC, PDSP, GPP, FPGA & Memory. **[10]**

b) What are conventional FPGA interconnects, Sate its limitations. **[6]**

Q4) Write short note on (any three) **[18]**

a) Multicontext FPGA

b) Crossbars

c) RALU

d) Partial Reconfiguration

P.T.O.

SECTION - II

Q5) a) Explain the Issues in Reconfigurable Network Design. **[8]**

b) What are the most common techniques used to reduce instruction size and bandwidth. **[8]**

Q6) a) Draw and explain the architecture of TSFPGA. Explore each block. State the appropriate application. **[10]**

b) What are the effects of interconnect granularity. **[6]**

Q7) a) What is partially reconfigurable? Is it supported in any present device? How do you decide that the task needs fully reconfigurable device? **[8]**

b) Explain Rent's Rule for interconnect model. **[8]**

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

a) Granularity.

b) Fine and course grained structures.

c) Configurable, Programmable, and fixed-Function devices.

d) Weak upper bound and interconnect.

Total No. of Questions : 8]

SEAT No. :

P2830

[Total No. of Pages :2

[4660] - 372
M.E. (Electronics) (Digital Systems)
c - DIGITAL SIGNAL COMPRESSION
(2008 Revised Pattern) (Elective - IV (Open)) (504205) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Use of scientific Calculator is allowed.***
5) ***Assume Suitable data wherever required.***

SECTION - I

Q1) a) Find the optimal Huffman code for a source emitting 6 alphabets with probabilities given by

{a1-0.2, a2-0.05, a3-0.2, a4-0.2, a5-0.25, a6-0.1} **[8]**

b) Compare in tabular form **[8]**

i) Huffman coding with Arithmetic coding.

ii) Lossy coder with Lossless coder

Q2) a) Why is a uniform quantizer not suitable for speech coding? Explain how a non-uniform quantizer will avoid granular noise and slope overload distortion? **[9]**

b) Explain a backward adaptive quantizer for speech with a block schematic. **[9]**

Q3) a) For following data sequence, Perform any suitable lossless compression. Also perform suitable lossy compression with quantization. **[8]**

{52,52,52,54,54,54,54,56,56,58,58,58}

b) What are methods for music compression? Explain MIDI. **[8]**

P.T.O.

Q4) a) Explain Linear predictive coding and decoding for speech. **[8]**

b) Given a tolerable limit for data rate, how will you select the coding scheme for achieving allowable distortion? **[8]**

SECTION - II

Q5) a) Explain the method to decompose a signal in number of sub bands. What is the advantage of using sub band coding? **[8]**

b) Consider a speech signal. Use DCT to convert the signal in transform domain. How will you design a quantizer to code the DCT coefficients so that a signal can be compressed? **[8]**

Q6) a) Consider a 128*128 image. If you decompose it using a Haar wavelet, describe a decomposed image segments (LL, LH, HL and HH). Can you achieve compression using a suitable quantizer? **[8]**

b) Explain a DPCM system with adaptive and predictive encoder. **[8]**

Q7) a) Explain the procedure for coding a wavelet decomposed image using EZW. **[8]**

b) Consider a sample 4*4 array of wavelet coefficients. Use a suitable threshold and show the coding using SPIHT in first two passes and generate a bit stream for transmission for first two passes. **[10]**

Q8) a) Explain the procedure for coding a video. Indicate what is I frame and what is a P frame. **[8]**

b) How will you generate a motion vector for coding a sequence of images. **[8]**

Total No. of Questions : 10]

SEAT No. :

P2831

[Total No. of Pages : 5

[4660] - 373

M.E. (Production Engineering)(Manufacturing & Automation)

MATHEMATICS AND STATISTICS

(2008 Pattern) (Semester - I) (511101)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Find the analytic function whose real part is $\frac{\sin 2x}{(\cosh 2y - \cos 2x)}$. **[6]**

b) Find the bilinear transformation which maps the points $z = 1, i, -1$ on to the points $w = i, 0, -1$.

Hence find i) the image of $|z| < 1$,

ii) the invariant points of this transformation. **[6]**

c) Is the function $u(x,y) = 2xy + 3xy^2 - 2y^3$ harmonic. **[5]**

Q2) a) Find the Taylor series expansion of $f(z) = \frac{1}{z^2 - z - 6}$ about $z = -1$, $z = 1$ and determine region of convergence. **[7]**

b) Determine poles of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ and residue at each pole, also evaluate $\int_C f(z)\,dz$, where C is the circle $|z| = 2.5$. **[6]**

P.T.O.

c) Prove that $\int_C (z-a)^n \, dz = 0$ (n is any integer $\neq -1$), where C is the circle $|z-a| = r$. **[4]**

Q3) a) On which curve the functional $\int_0^{\pi/2} \left(y'^2 - y^2 + 2xy\right) dx$ with y(0) = 0 and $y\left(\frac{\pi}{2}\right) = 0$ be extremized. **[8]**

b) Use Galerkin's method to solve the boundary value problem

$y''-y+x=0$ $(0 \le x \le 1)$ with $y(0)=0, y(1)=0$. Compare your approximate solution with exact solution. **[8]**

Q4) a) Evaluate the pivotal for $\frac{1}{2}$ period of vibrations by solving

$$25\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}; u(0,t)=0, \; u(5,t)=0,$$

$$u(x,0) = 2x, \qquad 0 \le x \le \frac{5}{2}$$

$$= 10-2x, \; \frac{5}{2} \le x \le 5$$

by taking $h = 1$, t = $\frac{1}{5}$ **[8]**

b) Find the values of $u(x,t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2}$ subject to the boundary conditions $u(0,t) = 10$, $u(6,t) = 18$ and $u(x,0) = x^2$ with $h = 1$, and $t = \frac{1}{8}j$; $j = 0, 1, 2, ...8$; $x = i$, $i = 0,1,....5$ by explicit method (take $\lambda = \frac{1}{4}$). **[8]**

Q5) a) Using Cauchy's Integral formula evaluate,

$F(z_0) = \int_C \frac{4z^2 + z + 5}{(z - z_0)}$ dz, where 'C' is the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$. Find the values of

i) F(3.5) ii) F (i) iii) $F'(-1)$ iv) F"($-i$) **[8]**

b) Solve the Poisson equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -36(x^3 + y^3 + 5)$ subject to the conditions $u = 0$, at $x = 0$ and $x = 1$. $u = 0$ at $y = 0$ and $u = 1$ at $y = 1$ in $0 \le x \le 1$. Find solution taking $h = \frac{1}{3}$ a square mesh. **[8]**

SECTION - II

Q6) a) Prove that

i) $(n+1)P_{n+1}(x) = (2n+1)\, x\, P_n(x) - nP_{n-1}(x)$

ii) $nP_n(x) - P_{n-1}(x) = 0$ **[6]**

b) Express x^5 in terms of Legendre's polynomials. **[5]**

c) Prove that $J_{-n}(x) = (-1)^n J_n(x)$ **[5]**

Q7) a) Suppose the diameter of a motor shaft in a lot have a mean 0.249 inches and standard deviation of 0.003 inches, the inner diameter of another bearing in another lot have a mean of 0.255 inches and standard deviation 0.02 inches. **[8]**

i) Find the mean and standard deviation clearances between shafts and bearings selected from these lots.

ii) If a shaft and bearing are selected at random, find the probability that the shaft will not fit inside bearing. Assume that both dimensions are normally distributed.

b) Fit a binomial distribution to the following data.

x :	0	1	2	3	4
f :	30	62	46	10	2

[8]

Q8) a) Find the mean recurrance time for each state of the following markov chain

$$P = \begin{bmatrix} 0.5 & 0.3 & 0.2 \\ 0.2 & 0.4 & 0.4 \\ 0.1 & 0.5 & 0.4 \end{bmatrix}$$

[8]

b) Fit a Poisson distribution for the following set of observations.

x :	0	1	2	3	4	5
f :	20	16	11	7	4	2

[8]

Q9) a) Test the normality of the following distribution by using chi- square test of goodness of fit. **[9]**

x :	125	135	145	155	165	175	185	195	205
f :	1	1	14	22	25	19	13	3	2

b) The probability of a successful rocket launching is P. If launching attempts are made until 3 successful launchings have occurred, what is the probability that fewer than 5 attempts will be necessary. If launching attempts are made until 3 consecutive successful launchings occur, what are the probabilities. **[8]**

Q10)a) A controlled manufacturing process is 0.2% defective. What is the probability of taking 2 or more defectives from a lot of 100 pieces? **[9]**

i) By using Binomial distribution.

ii) By using Poisson approximation.

b) Which of the following stochastic matrices are ergodic and which of them are regular. **[8]**

i) $\begin{bmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ 0 & 1 & 0 \\ \frac{1}{2} & \frac{1}{2} & \frac{1}{4} \end{bmatrix}$

ii) $\begin{bmatrix} 0 & 0 & 1 \\ \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ 0 & 1 & 0 \end{bmatrix}$

iii) $\begin{bmatrix} \frac{1}{4} & \frac{1}{4} & \frac{1}{2} \\ \frac{1}{4} & \frac{3}{4} & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \end{bmatrix}$

iv) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

Total No. of Questions : 10]

SEAT No. :

P3279

[Total No. of Pages : 2

[4660] - 375

M.E. (Production Engg.)

ADVANCE MANUFACTURING PROCESSES

(2008 Revised Course) (Semester - I) (511103)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Question 5 & Question 10 are compulsory.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***
6) ***Figures to the right indicate full marks.***
7) ***Use non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Explain the grain growth and structure of metal in solidification of molten metal. **[8]**

b) Explain the gating system and mold design. **[8]**

Q2) a) Explain fluidity & the test for fluidity. How to increase fluidity in metal Casting. **[8]**

b) Explain the types of weld joints and applications of each type. **[8]**

Q3) a) Explain destructive & non-destructive testing methods in welding. **[8]**

b) Explain the heat affected zone characteristics in fusion welding. **[8]**

Q4) a) Explain dry electro discharge machining. **[8]**

b) Explain the mechanism of material removal in Laser Beam Machining. State the applications and limitations. **[8]**

P.T.O.

Q5) Write short notes on following (Any three) **[18]**

a) Residual stresses & distrortion in welding.

b) Vaccum Coating

c) Ballistic machining

d) Electro Discharge Machining

e) Applications of Injection molding.

SECTION - II

Q6) a) What is meant by flow stress & strain rate? Explain the relation of flow stress & strain rate for a typical metal at different temperatures. **[8]**

b) Write a note on slip line field theory in forming process. **[8]**

Q7) a) Explain the principle of High energy rate forming? State the applications of the same. **[8]**

b) Explain the process parameters of peen forming. **[8]**

Q8) a) What are the control parameters for extrusion process? Explain in applications of the same. **[8]**

b) Explain the applications of electromagnetic forming. **[8]**

Q9) a) Explain formability of sheet metal forming limit curve. **[8]**

b) i) Explain sheet metal bending process. What is meant by bend allowance & Bending force? **[8]**

ii) A 20 mm wide and 4 mm thick C 20 steel sheet is required to be bent at 60^{o} at bend radius 10 mm. for $R > 2t$, $k = 0.5$. Determine the bend allowance.

Q10) Write Short notes on (Any three). **[18]**

a) Fine Blanking

b) Plastic anisotropy

c) Explosives used in explosive welding

d) Cup forming

e) High speed hot forging

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Total No. of Questions : 11]

SEAT No. :

P2832

[Total No. of Pages : 5

[4660] - 377
M.E (Production Engineering)
b - RELIABILITY AND FAILURE ANALYSIS
(2008 Revised Course) (511104) (Semester - I) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain with neat sketch probability mass function (PMF) and cumulative distribution function (CDF) properties of discrete variables in reliability engineering. **[4]**

b) A series of tests conducted under certain stipulated conditions on 800 electronic Components, the total duration of tests is 15 hrs. The number of components that fail during each hourly interval is noted. The results obtained are tabulated as shown in table

Time(t)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
No.of failures	00	120	85	71	62	53	45	41	37	35	29	50	45	63	35	29

Based on the failure data or survival test results shown in table. Define & Calculate failure density (fd); failure rate (Z) and Reliability (R). **[12]**

OR

Q2) a) What do you mean by failure rate and repair rate? **[4]**

b) In order to test the strength of a new glue, ten similar structures constructed using the glue were subjected to a continuous vibratory load, and the duration of survival of each structure was noted, the values obtained the following

P.T.O.

Specimen Numbers	01	02	03	04	05	06	07	08	09	10
Hours of Survival	60	62	58	50	61	55	59	62	54	55

Calculate the mean time to failure (MTTF) from this data. **[6]**

c) In a test involving continuous satisfactory performance of 110 electronic instruments under excessive vibration conditions, the following failure frequencies were observed, the total test period being 8 hrs.

Time interval	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8
Number of failures	3	16	22	42	11	09	04	03

Calculate the mean time to failures (MTTF) from this data. **[6]**

Q3) a) Explain the concept of "Techno-Physico Constraints" with a conceptual system. **[6]**

b) Construct a fault tree from Fig.1 such that the top event is a system failure and component failures are basic events. If Pr{A} = Pr{B}=0.9, Pr{C}=Pr{D}=0.8 and Pr{E}=Pr{F}=0.75, compute the probability of the top event. **[10]**

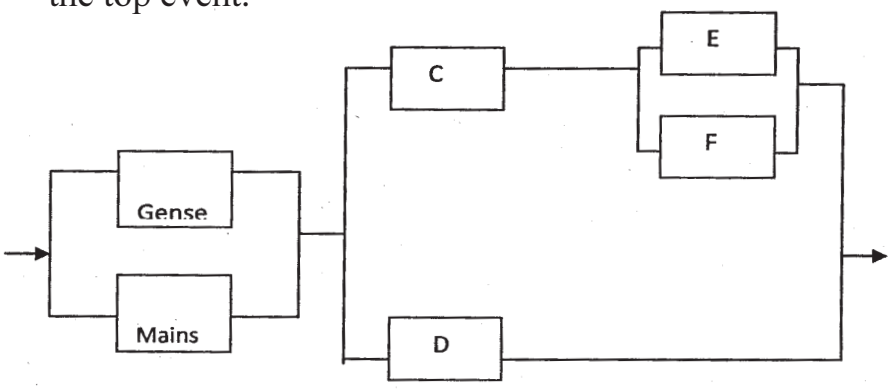

Fig.1

OR

Q4) a) An engineer approximate the reliability of a cutting assembly by

$$R(t) = \begin{cases} \left(1 - \frac{t}{to}\right)^2, & 0 \le t \le to, \\ 0 & t \ge to. \end{cases}$$

i) Determine the failure rate.

ii) Does the failure rate increase or decrease with time.

iii) Determine the MTTF. **[8]**

b) Construct a reliability block diagram Fig.2 for given fault tree. **[8]**

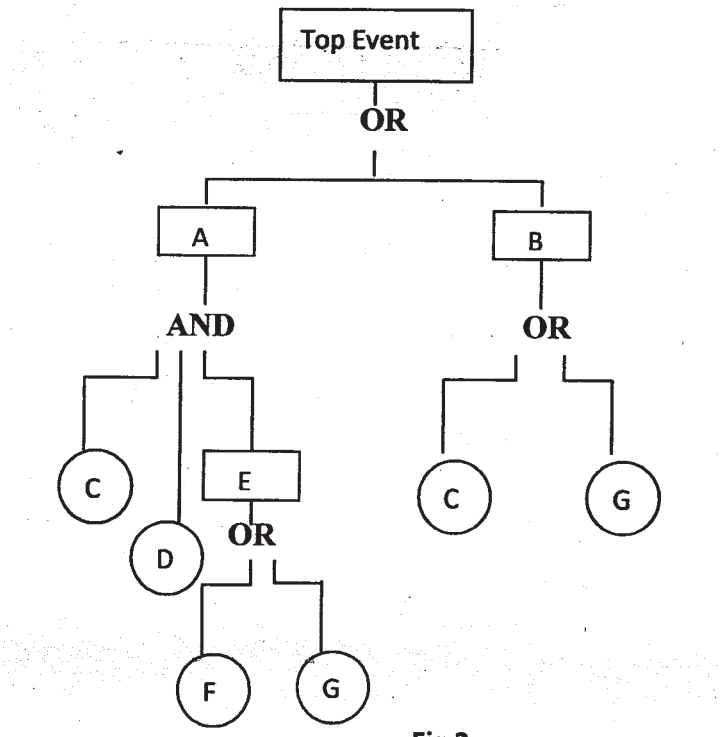

Fig.2

Q5) a) Discuss the relationship between quality and reliability. **[6]**

b) In the following table are times (indays) over a six months period at which failure of a production line occurred (t_j) and times (t_r) at which the plant was brought back on the line following repair: **[12]**

I	t_{fi}	t_{ri}	i	t_{fi}	t_{ri}
1	12.8	13	6	56.4	57.3
2	14.2	14.8	7	62.7	62.8
3	25.4	25.8	8	131.2	134.9
4	31.4	33.3	9	146.7	150.0
5	35.3	35.6	10	177.0	177.1

i) Calculate the six month interval availability from the plant data.

ii) Estimate MTTF and MTTR from the data.

iii) Estimate the interval availability.

OR

Q6) a) Explain with appropriate example Mean time to Failure (MTTF) and Mean time to repair (MTTR). **[6]**

b) Find the reliability of the configurations shown below in Fig.3, **[8]**

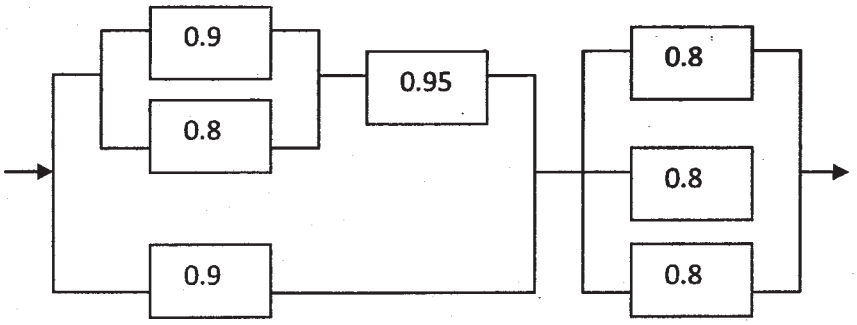

Fig.3

c) What do you mean by failure rate and repair rate? **[4]**

SECTION - II

Q7) a) Define Tero-technology and state the importance of the same in evolving the "LCC" of an asset. **[6]**

b) Calculate the mean, variance skewness and kurtosis of the stopping power data given in the following table **[10]**

	A	B	C	D	E	F	G
1	39	54	21	42	66	50	56
2	62	59	40	41	75	63	58
3	32	43	51	60	65	48	61
4	27	46	60	73	36	38	54
5	60	36	35	76	54	55	45
6	71	54	46	47	42	52	47
7	62	55	49	39	40	69	58
8	52	78	56	55	62	32	57
9	45	84	36	58	64	67	62
10	51	36	73	37	42	53	49

OR

Q8) a) Explain mean and median ranking method. **[8]**

b) The following data refer to 'Mean time to failure' of a equipment used in electric power house installation:

Failure No.	1	2	3	4	5	6	7	8	9
MTBF(Hrs)	31.3	45.9	78.3	22.1	2.3	4.8	8.1	11.3	17.3

Plot the reliability against time using the method median statistics. How will values changes with mean statistics? **[8]**

Q9) a) Explain **[8]**

i) Inherent availability

ii) Achieved availability

iii) Operational Availability

b) Derive an expression $Rp(t) = e^{-\lambda 1t} + e^{-\lambda 2t} - e^{-(\lambda 1+\lambda 2)t}$. **[8]**

OR

Q10)a) Derive and expression for techno-economic life of equipment given maintenance function (at^n), operating cost per year (v) and first cost(C). **[6]**

b) A device has a decreasing failure rate characterized by a two parameter weibull distribution with $\theta = 180$ years and $m = 1/2$. The device is required to have a design life reliability of 0.90. **[10]**

i) What is the design life if there is no wear in period?

ii) What is the design life if the device is first subject to a wear in period of one month?

Q11)Write short note on (Any 3): **[18]**

a) Fault tree analysis.

b) Risk priority number in FMEA.

c) Total Productive Maintenance.

d) Censored and Uncensored data.

e) Ferro-graphy and SOAP program.

Total No. of Questions : 8]

SEAT No. :

P3332

[Total No. of Pages : 2

[4660]-378
M.E. (Production)
C : SUPPLY CHAIN MANAGEMENT
(2008 Pattern) (Semester - I) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Define Supply chain and explain clearly the decision phases in a supply chain. **[8]**

b) What is a supply chain? Explain various stages in the supply chain. **[8]**

Q2) a) What are the major drivers of supply chain performance? Explain in details. **[8]**

b) Explain the factors that influence network design decisions. **[8]**

Q3) a) Explain Push versus Pull based supply chain models. **[8]**

b) What are different logistics functions? Explain the role of each function in detail. **[8]**

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

a) Just – in – Time Strategy.

b) Aggregate planning in supply chain management.

c) Framework for structuring drivers.

d) The Bullwhip Effect.

P.T.O.

SECTION - II

Q5) a) What are basic considerations in material handling system design for warehouse? **[8]**

b) List the factors influencing transport economics and Explain any two. **[8]**

Q6) a) Explain the management of safety inventory in multiechelon supply chain. **[8]**

b) Explain the cost structure in transportation economics and pricing. **[8]**

Q7) a) Explain the scope of emerging distributed cooperative tele-manufacturing over internet. **[8]**

b) Explain the role of IT in supply chain management. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Milk Round System

b) Role of Enterprise Resource Planning in SCM

c) Warehouse operating principles.

d) Economic Order Quantity.

Total No. of Questions : 12]

SEAT No. :

P2833

[Total No. of Pages : 3

[4660] - 379
M.E. (Production)
d - ADVANCED MACHINE TOOL DESIGN
(Revised Course 2008) (Semester - I) (Elective - I) (511104)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to two sections should be written in separate answer books.***
2) ***Attempt three question from each section.***
3) ***Neat diagrams must be drawn wherver necessary.***
4) ***Figures to the indicate full marks.***
5) ***Use of non programmable electronic pocket Calculator and statistical tables is allowed.***
6) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) What do you understand by kinematic structures in machine tools? **[6]**

b) What are the distinctive features of machining and turning centers? Why are they so versatile? **[6]**

c) Illustrate with a neat sketch the kinematic structure for a broaching machine. **[6]**

OR

Q2) a) What is meant by high efficiency machining range? Explain in brief? **[8]**

b) Deduce the expression for power in milling machine and show diagrammatically the forces acting on milling cutter during machining.**[10]**

Q3) a) Why is the stiffness of machine tools so important in machining operation? **[8]**

b) During the drilling operation on a radial drilling machine, analyze the different forces acting on the radial arm. Explain the procedure to design the radial arm. **[8]**

OR

P.T.O.

Q4) a) Discuss the common requirements of spindle support. **[6]**

b) Why it is essential to preload the bearings of spindle mountage? **[4]**

c) Explain with sketches the methods of preloading a ball screw. **[6]**

Q5) a) A nine speed gear box is to be designed for the minimum speed of 100 rpm and maximum speed of 1600 rpm. It is to be driven by an induction motor rotating at 1500 rpm. Draw best structural diagram, optimum ray diagram and gear box layout. **[10]**

b) With the help of schematic diagram explain the working principle of any one type of electrical control system incorporated in machine tool. **[6]**

OR

Q6) a) What is meant by regenerative chatter? Explain it with reference to any one type of machine tool. **[8]**

b) What do you understand by Hydraulic Power Pack in machine tool? Explain the factors used for selecting fluids for hydraulic system. **[8]**

SECTION - II

Q7) a) Explain with a block diagram the working principle of CNC machine. **[6]**

b) What procedure is used by the operator to determine the tool length offsets? **[6]**

c) What are the five basic types of tool changers? **[6]**

OR

Q8) a) How does a 180^{o} rotation toil changer work? How does a pivot insertion tool changer work in CNC machine? **[6]**

b) Explain the working principle of recirculating ball screws commonly used in CNC versions. What are its special advantages? **[6]**

c) Would it be possible to design and build machining and turning centers without the use of computer controls? Explain. **[6]**

Q9) a) Why is damping of machine tools important? How is it accomplished? **[6]**

b) Write a note on dynamic characteristic of the cutting process. **[6]**

c) Why is thermal expansion of machine tool components important? **[4]**

OR

Q10)a) What do you understand by stick-slip motion? Explain with a suitable example. **[8]**

b) Describe the procedure followed in performing acceptance tests for machine tools. **[8]**

Q11)a) Explain the importance of aesthetics as a requirement in machine tool design with a suitable example. **[8]**

b) Explain the concept of ergonomics as applied to different parts of machine tool. **[8]**

OR

Q12)a) Discuss the modern trends in design of machine tools. **[8]**

b) Describe how CAD techniques can be applied in design of machine tool structures. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2744

[Total No. of Pages :3

[4660]-38
M.E. (Civil-Hydraulics Engg.)
COMPUTATIONAL METHODS IN HYDRAULICS
(2008 Course) (Semester-I) (501301)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) What do you understand by elliptic, parabolic and hyperbolic partial differential equations? **[5]**

b) Write down the finite difference analogue of the equation, $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0.$ **[5]**

c) Explain how the finite difference method is used in Hydraulic Engineering. **[6]**

Q2) a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ at the pivotal points of the grid shown in the fig.2.a. **[9]**

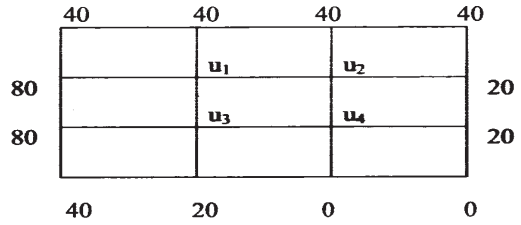

Fig.2.a.

b) Solve the Poisson equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=-500.$ Over the square with sides $x=0, x=3, y=0, y=3$ with u= -100 along the boundary and mesh length=1. **[8]**

P.T.O

Q3) a) Explain the concept of correlation and regression. Define the karl pearson's correlation coefficient and discuss its important properties. **[6]**

b) Explain: **[6]**

i) Markov chain

ii) Markov process

iii) Beta β and Gamma γ distribution.

c) The annual runoff of a stream is assumed to follow normal distribution with a mean of 2390 ha-m and a slandered deviation of 567 ha-m. Find the probability that the annual runoff in any year is greater than 3000 ha-m. What is probability that annual runoff in any year will be between 1800 and 2800 ha-m. **[5]**

Q4) a) The following table gives the number of rainy days in the first week of July observed for a period of 50 years at a rain gauge station. Test the goodness of feet for binomial distribution at a 5% significance level using Chi-square test. **[8]**

No. of rainy days	0	1	2	3	4	5	6	7
No. of years	2	9	15	13	7	3	1	0

Use the following chi-square distribution table for α=0.05

υ	3	4	5	6	7
χ^2	7.8147	9.4877	11.07	12.59	14.067

b) Solve the following system of simultaneous equations by relaxation method. **[8]**

$$10x - 2y - 3z = 205$$
$$-2x + 10y - 2z = 154$$
$$-2x - y + 10z = 120$$

SECTION-II

Q5) a) Explain Joukowski's transformation w=z+1/z. **[5]**

b) Show how you will use Schwarz-Christoffel transformation to map the semi- infinite strip enclosed by the real axis and the lines u=$\pm$1 of the w-plane in to the upper half of the z-plane. **[6]**

c) Use trapezoidal rule to evaluate $\int_0^1 \frac{dx}{1+x}$ considering suitable subintervals. **[5]**

Q6) a) Use Simpsons1/3 rule to find $\int_0^1 \frac{e^x dx}{1+x}$. **[5]**

b) Explain Newton-Cote's quadrature formula and hence how you obtain different numerical integration rules. **[8]**

c) Expand $f(z)=\sin z$ in a Taylor's series about $z=\pi/4$. **[5]**

Q7) a) Use Gauss Quadrature three point formula to evaluate $I = \int_0^1 \frac{dx}{1+x^2}$. **[6]**

b) The reservoir discharging water through sluices at a depth h below the water surface has a surface area A for various values of h as given below:

h (m.)	3.048	3.353	3.658	3.963	4.268
A (m^2)	88.303	99.457	111.540	125.483	142.214

If t denotes time in minutes, the rate of fall of surface is given by $dh/dt = -48\frac{\sqrt{h}}{A}$. Estimate the time taken for the water level to fall from 4.268 to 3.038 m. above the sluices. **[10]**

Q8) a) Use Cauchy's integral formula to evaluate $\oint \frac{e^{2z} dz}{(z+1)^4}$ where C is circle $|z| = 2$. **[6]**

b) Discuss the motion of the fluid having the complex potential $\Omega(z)$=I K log z where k>0. **[5]**

c) Find the image of infinite strip ¼ < y < ½ under the transformations $w=1/z$, also show the regions graphically. **[5]**

□□□□

Total No. of Questions : 8]

SEAT No. :

P2834

[Total No. of Pages : 3

[4660] - 380
M.E (Production Engineering)
(a) ADVANCED ROBOTICS
(2008 Course) (511105) (Elective - II) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Explain the relation between industrial automation and robotics. Discuss broad classification of robots. **[10]**

b) Explain the use of Robot in following operations:

i) Plastic moulding

ii) Forging operation

iii) Machining operations

iv) Stamping operations **[8]**

Q2) a) A camera locates an object and the robot base by following transformation matrices,

$$^{camera}T_{object} = \begin{bmatrix} 0 & 0 & 1 & 40 \\ 1 & 0 & 0 & -15 \\ 0 & 1 & 0 & 23 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

P.T.O.

and ${}^{camera}T_{robot} = \begin{bmatrix} -1 & 0 & 0 & 65 \\ 1 & 0 & -1 & -25 \\ 0 & -1 & 0 & 75 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

Determine the relation of the object with respect to the robot base. Also determine the transformation matrices of the object and the robot base with respect to the camera, if the camera is rotated by 90^o about its own X-axis. **[8]**

b) List the steps involved in DH convention with suitable example. **[8]**

Q3) a) Explain vacuum grippers with reference to the principle, characteristics, use and advantages. **[8]**

b) Why controls are required in Robot? Explain different types of controls used in Robot. **[8]**

Q4) a) With neat sketches explain in brief.

i) Magnetic Grippers

ii) Mechanical Grippers **[8]**

b) Define end-effector. What are the two major categories of end-effectors. **[8]**

SECTION - II

Q5) a) Explain: **[10]**

i) Manual mode of programming.

ii) Lead through mode of programming.

iii) Textual robot Language.

iv) Off-line programming mode.

b) Describe Force and Torque sensors used in robot. **[8]**

Q6) a) What is the function of a range sensor in the robot work cell? Explain various range sensing techniques. **[8]**

b) What are the functions of machine vision system in Robot? **[8]**

Q7) a) Enumerate the considerations for the manipulator design based on the task to be performed. **[8]**

b) Explain Degree of freedom (DOF), Mobility and DH parameters in brief with suitable example. **[8]**

Q8) a) Compare Newton-Euler and Lagrange-Euler formulations. **[8]**

b) Explain the role of Jacobian matrix in the path control strategy. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2835

[Total No. of Pages :2

[4660] - 381
M.E (Production)
(b) SHEET METAL PROCESSING
(2008 Course) (Elective - II) (511105) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain different defects appearing in sheet metal product. **[8]**

b) Discuss the properties and grades of sheet metal giving the testing procedure for them. **[8]**

Q2) a) Explain with suitable example how the Forming limit diagram help in product design. **[8]**

b) Explain slip line fields for all possible friction coefficient applicable to compression with width/height = 2 : 1. **[8]**

Q3) a) Write steps followed in deep drawing of sheet metal part. **[8]**

b) Explain different methods for testing of sheet metal product. **[8]**

Q4) Write short notes on any three: **[18]**

a) attributes of material behavior affecting sheet metal product.

b) analytical method for prediction of forming limits.

c) spring back compensation criteria.

d) Drawing of axysymetric parts.

P.T.O.

SECTION - II

Q5) a) Explain different steps to be followed in a sheet metal joining process. **[8]**

b) What is mean by roll forming? Discuss different method for it. **[8]**

Q6) a) Explain different drive systems used in presses used for sheet metal. **[8]**

b) State necessasity of safety devices and their selection at press shop. **[8]**

Q7) a) Explain numerical methods of analysis of forming process. **[8]**

b) Discuss the application of CAM in sheet metal forming with suitable example. **[8]**

Q8) Write short notes on any three: **[18]**

a) Devices for handling of pressed out parts.

b) Selection criteria for presses.

c) Centre of pressure in press operation.

d) Strain distribution of a drawn component.

Total No. of Questions :8]

SEAT No. :

P2836

[Total No. of Pages :3

[4660]-382

M.E. (Production) (Manufacturing & Automation)

c - TOOL AND DIE DESIGN

(2008 Pattern) (Elective -II) (Semester - I) (511105)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Calculate maximum possible depth of cut for a 20 square tool shank. Given that tool shank has UTS 550 MPa, Tool overhang 30 mm, $E=2.1x10^5$, feed per revolution 0.5, factor of safety=2, Unit cutting force for cutting MS material=1210 MPa, maximum permissible deflection=0.05. **[8]**

b) Draw the neat sketch of a pull type of broach and show all elements. Also draw a magnified portion a broach showing the geometric parameters. State the tooth proportions in the terms of pitch. **[8]**

Q2) a) What factors should be considered while designing a clamp for jig and fixture. **[8]**

b) Explain the effect of tolerance of diameter of cylindrical workpiece on V-block location. **[8]**

Q3) a) A hole 100 mm diameter is to be punched in steel plate 5.6 mm thick. The material is cold rolled 0.4% C steel for which ultimate shear strength is 550 MPa. With normal clearance on the tool, cutting is completed at 40% penetration of the punch. Determine suitable diameter for punch and die and a suitable shear angle for the punch in order to bring the work within capacity of 30 ton press. **[10]**

b) Sketch various methods of holding punches. **[6]**

P.T.O.

Q4) Write short notes on: **[18]**

a) Principle of Foolproof location in Jigs and Fixtures.

b) System of cutting tool nomenclatures and their interrelations.

c) Direct and indirect pilots in press tools.

SECTION -II

Q5) a) Design the forging die for the component shown in Fig. 1 made up of steel having density 7.85 gm/cm^3. (Dimensions shown in figure are in mm) **[10]**

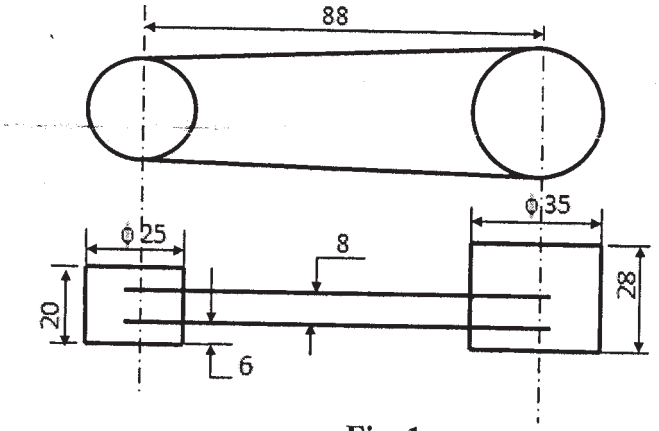

Fig. 1

b) Describe various preliminary operations to be performed in multi-impression die. **[6]**

Q6) Following data apply to the component shown in Figure 2.

Material: PVC with density 1.38 gm/cm^3; Shrinkage 0.96% spatial; Modulus of elasticity: 3x10^3 MPa; Number of impressions: 1, Poisson ratio and Modulus of elasticity for mold material are 3.33 and 2 x 10^5 respectively, Coefficient of friction = 0.1, Material constant for PVC= 0.9, Injection pressure 50 MPa, Assume outside dimension of cavity 200x200 mm.

a) Calculate the mold opening force. **[4]**

b) Calculate the ejection force and the dimensions of the ejection element. **[5]**

c) Determine the gate dimensions, runner dimensions, and runner layout. **[5]**

d) Sketch the assembly of the mold. **[4]**

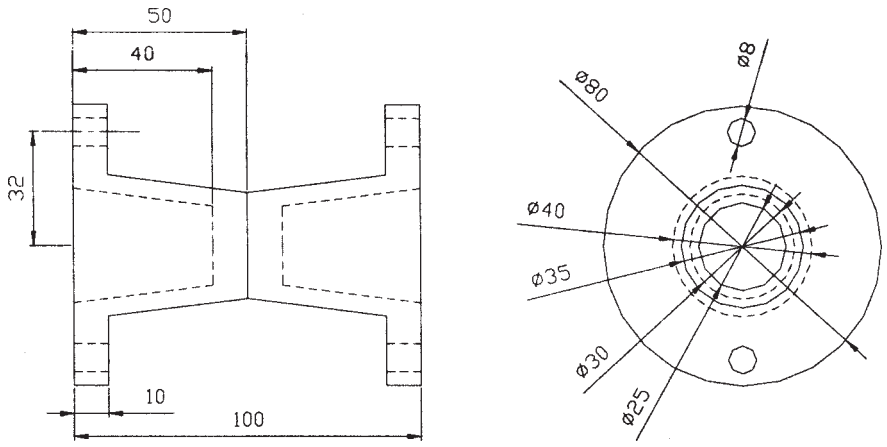

Fig. 2

Q7) a) Explain the significance of draft, fillet, parting line and wall thickness in die casting die design. **[8]**

b) Explain advantages and limitations of die casting process. **[8]**

Q8) Write short notes on: **[18]**

a) Determination of economical number of impressions in injection mould.

b) Defects in die casting.

c) Factors affecting selection of parting line in forging.

EEE

Total No. of Questions :8]

SEAT No. :

P2837

[Total No. of Pages :2

[4660]-383

M.E. (Manufacturing & automation)(Production Engg.)
d - ENGINEERING ECONOMICS AND ACCOUNTING
(2008 Course) (Elective - II) (Semester - I) (511105)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Define Managerial Economics. Discuss its scope and practical significance. **[8]**

b) What are the Micro and Macro Concepts from Economics used in it? **[8]**

Q2) a) What is Demand Forecasting? Discuss any two methods used for it. **[8]**

b) Discuss various types of Price Elasticity of Demand along with its uses in Business Decision-making. **[8]**

Q3) a) How a monopoly Firm attains an equilibrium in the short-run for its Output and Price Determination. **[8]**

b) How price and output is determined in short run and long run under conditions of perfect competition? **[8]**

Q4) Write short note on(Any three): **[18]**

a) Exception to the Law of Demand.

b) Elasticity of Supply.

c) Pricing in Public sector undertakings.

d) Application of Economics.

P.T.O.

SECTION -II

Q5) a) Explain Resource Allocation in Cost Benefit Analysis. **[8]**

b) Explain Steps in Cost Benefit Analysis. **[8]**

Q6) a) Explain classification of costs in detail. **[8]**

b) Explain in detail Break-event Analysis. **[8]**

Q7) a) Explain methods of Investment Appraisal. **[8]**

b) Explain methods of depreciation. **[8]**

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

a) Private Vs Public Goods.

b) Types of Costing.

c) Internal Rate of Return.

d) Net Present Value.

EEE

Total No. of Questions :12]

SEAT No. :

P2838

[Total No. of Pages :2

[4660]-385
M.E. (Production Engineering)
MANUFACTURING MANAGEMENT
(2008 Pattern) (Semester - II) (511109)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Discuss contribution of any two pioneers in manufacturing management. **[10]**

b) Describe the scope of manufacturing management for production engineer. **[8]**

OR

Q2) a) What is quality revolution in case of manufacturing management. Discuss in brief. **[8]**

b) Describe the functions of manufacturing management. **[10]**

Q3) a) Explain any four functions of Production Planning and Control. **[8]**

b) What do you mean by scheduling techniques? Discuss any one in brief. **[8]**

OR

Q4) a) What is crashing of network? Describe with a good example. **[8]**

b) Explain the crashing of network used in PERT/CPM. **[8]**

Q5) a) What are the manufacturing challenges of information age? **[8]**

b) Write a note on agile manufacturing. **[8]**

OR

P.T.O.

Q6) a) What is reconfigurable manufacturing? How is it useful for a manufacturing manager? **[8]**

b) Discuss the importance of green production from manufacturing management perspective. **[8]**

SECTION -II

Q7) a) Describe the historical background of organizational behavior. **[6]**

b) Explain autocratic and custodial model of organizational behavior. **[12]**

OR

Q8) a) Write a short note on Development of personality. **[9]**

b) Describe Organizational commitment in detail. **[9]**

Q9) a) Describe characteristics of motives. **[8]**

b) Define morale and explain its relationship with productivity. **[8]**

OR

Q10)a) Discuss Herzberg's theory of job loading. **[8]**

b) Define leadership and explain its significance from manufacturing management perspective. **[8]**

Q11)a) Differentiate between formal and informal groups. **[8]**

b) Discuss theory of group formation in brief. **[8]**

OR

Q12)a) Discuss the strategies for encouraging constructive conflict. **[8]**

b) Write a short note on stress management. **[8]**

EEE

Total No. of Questions :8]

SEAT No. :

P2839

[Total No. of Pages :2

[4660]-386

M.E. (Production) (Manufacturing & Automation)

INDUSTRIAL AUTOMATION

(2008 Course) (Semester - II) (511110)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Total work content of a certain assembly job is 7.8 min. The estimated downtime of this line is 5%, and the required production rate is 80 units/hr. Determine **[10]**

i) Minimum number of workstations required to minimize balance delay.

ii) Balance delay.

iii) Feed rate if moving belt line is used.

b) Explain the upper bound and lower bound approach for analysis of transfer line. **[6]**

Q2) a) Calculate the pressure required for a pressing operation which requires 70 KN force. Given that: bore diameter of cylinder 40 mm, rod diameter 32 mm, weight of press tool 6 KN and counter balance valve is used in circuit. **[8]**

b) Draw a neat sketch of a pressure reducing valve explain its working. **[8]**

Q3) a) Explain hydro-pneumatic system. **[8]**

b) Draw a pneumatic circuit to actuate the cylinder if sensors C and D are in the same state (ON or OFF) as that sensor B and sensor A is in opposite state. **[8]**

P.T.O.

Q4) Write short notes on: **[18]**

a) Regenerative circuit.

b) Ranked positional weights method for assembly line balancing.

c) Cascade method for pneumatic circuit design.

SECTION -II

Q5) a) Draw ladder diagram to perform following operations of a washing machine: **[8]**

i) Switch on the motor pump.

ii) Switch off the pump after 60 seconds.

iii) Switch on the heater for 25 seconds.

iv) Switch off the heater.

b) What are the various components of process control system? Explain the function of each component briefly. **[8]**

Q6) a) Explain with neat sketch revolving feeder. **[8]**

b) Derive an expression to calculate efficiency of a material handling system. **[8]**

Q7) a) Derive the Euler - Lagrange equation for Robot dynamic. **[8]**

b) Give selection criteria of Robot, sensors used, selection of Drives and actuators, and method of control for robot application in welding in an industry. **[8]**

Q8) Write short notes on: **[18]**

a) Use of robot in assembly.

b) Robot vision system.

c) Use of accumulating timer in PLC.

EEE

Total No. of Questions :10]

SEAT No. :

P2840

[Total No. of Pages :2

[4660]-387
M.E. (Production)
PLASTICS PROCESSING
(2008 Course) (Elective III) (Semester - II) (511111)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) Explain the material selection of plastics for strength and stiffness. Also enumerate its property for ductility, creep and recovery behaviour of plastics. **[16]**

Q2) a) Develop a mathematical model of Viscoelastic behaviour for Maxwell model. **[8]**

b) Explain elastic behavious of polymer melts. **[8]**

Q3) a) Explain the procedure for compression Molding. **[8]**

b) A series of Charpy impact test on uPVC specimens with a range of crack depths gave the following results. **[8]**

Crack length (mm)	1	2	3	4	5
Fracture Energy (mJ)	100	62	46.5	37	31

If the sample section is 10 mm x 10 mm and the support width is 40 mm, calculate the facture toughness of the uPVC. The modulus of the uPVC is 2 GN/m^2.

Q4) a) Explain constructional features and layouts of runners and gates. **[8]**

b) Explain the rheological models for Polymer Melt Flow. **[8]**

P.T.O.

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

a) Limitations of compression molding.

b) Polymerization techniques.

c) Rotational Moulding.

d) Calendering.

SECTION -II

Q6) a) Explain the various consideration in product design of moulded products for wall thickness, drafts and ribs. **[8]**

b) Explain the standards of tolerances for polystyrene. **[8]**

Q7) a) Explain how will you avoid warpage with specific reference to molding conditions: **[8]**

i) Mold temperature

ii) Melt temperature

b) Explain with neat sketch cross section of typical steam chest mold. **[8]**

Q8) a) Explain different types of inserts: **[8]**

i) Leak-proof inserts.

ii) Non metallic Inserts.

b) Explain the process for Reaction Injection Molding. **[8]**

Q9) Explain three major methods of modeling commonly used today: **[16]**

a) Wire Frame Modeling

b) Surface modeling

c) Solid Modeling

Q10) Write short notes on (Any three): **[18]**

a) Design of ejection system.

b) Injection Molding Pressess.

c) Compression Molds.

d) Software's for mold flow analysis.

EEE

Total No. of Questions :8]

SEAT No. :

P2841

[Total No. of Pages :2

[4660]-388
M.E. (Production)
b - PRODUCT LIFECYCLE MANAGEMENT
(2008 Course) (Elective -III) (Semester - II) (511111)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) "Product life cycle management - A winning strategy". Explain. **[8]**

b) What are the principles for PLM strategy? Enlist the benefits of PLM. **[8]**

Q2) a) Explain in brief various phases for product life cycle & corresponding technologies. **[8]**

b) Explain the following: **[8]**

i) Compare systematic engineering and concurrent engineering.

ii) Compare bottom up design and Top down design.

Q3) a) Explain the barriers in Product Lifecycle Management Implementation. **[8]**

b) What is difference in informal and formal model? Give a suitable example of successful Implementation. **[8]**

Q4) Write short note on Any Three: **[18]**

a) ISO 10303

b) Issues in the financial justification of PDM.

c) Reasons for implementing PDM system

d) Product Portfolio Management.

P.T.O.

SECTION -II

Q5) a) "PLM is a process of guiding a product from concept through retirement as well as process. To deliver the most business value to an enterprise and its trading partners". Explain in brief. **[8]**

b) Describe the human factors in product design. **[8]**

Q6) a) "PLM enables collaboration between multiple functions, departments, disciplines and between OEM and suppliers. It aims to achieve true interoperability in these domains and have a toolset and configurability to optimize processes network". Explain in brief. **[8]**

b) Explain steps followed in new product development in conventional way and in Prototyping way. **[8]**

Q7) a) Describe any two qualitative forecasting techniques and their advantages and disadvantages. **[8]**

b) "And this is one way to do technology forecasting: get a sense of where technology is, and then Anticipate the next upturn". Explain in brief in the context of mobile communication. **[8]**

Q8) Write short notes on any Three: **[18]**

a) Technologies on the morphological curve.

b) Steps in tracking new product program.

c) Design for Manufacture and Assembly.

d) Design for X.

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Total No. of Questions :12]

SEAT No. :

P2842

[Total No. of Pages :3

[4660]-389
M.E. (Production)
c - WELDING & JOINING
(2008 Course) (Elective -III) (Semester - II) (511111)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Explain indetail classification of welding and its allied processes, with sub classification. **[9]**

b) What is HAZ [Heat affected zone] in Arc welding?
Explain with sketch, the variation of peak temperature along the H.A.Z and its effect on iron - carbon phase during welding steel. **[9]**

OR

Q2) a) Explain different methods of weldability testing in brief. **[9]**

b) What are the metallurgical effects of welding? Explain. **[9]**

Q3) a) What are the electrical characteristics of an Arc, in Arc welding processes? Explain. **[8]**

b) Explain Arc blow with the different factors which cause the Arc Blow. **[8]**

OR

P.T.O.

Q4) a) What is arc stability? Explain role of electrode polarity in Arc behaviour. **[8]**

b) What are the different types of welding Arc? **[8]**

Q5) a) What is deposition rate? Compare the deposition rates in Gas tungsten Arc welding (GTAW) process. Using hot wire and cold wire. **[8]**

b) Discuss on Arc instability caused by DC component in AC TIG welding. **[8]**

OR

Q6) a) Discuss three dimensional geometric effect on residual stress and strain in welding process. **[8]**

b) Explain classification and coding of electrodes for SMAW of low alloy steels CIS 1395 - 197. Explain meaning of E 31132 - CL as per BIS low alloy steel arc welding. **[8]**

SECTION -II

Q7) a) Explain different types of rectifiers used in welding? **[8]**

b) Explain the constant current characteristics of power sources used in Arc welding. **[8]**

OR

Q8) a) Explain with the help of block diagram and circuit diagram, the working principle of an solid state inverter used on welding power source. **[8]**

b) Explain with your own example, what is duty cycle? **[8]**

Q9) a) What is weld penetration shape factor and weld Ripples in case of metal transfer in welding? **[9]**

b) Explain effect of gravity, surface tension, electromagnetic pinch effect and drag force on metal transfer. **[9]**

OR

Q10)a) Discuss the "Droplet Transfer Frequency" for steel, using different welding processes. **[9]**

b) Explain different modes of metal transfer at least three modes. **[9]**

Q11)a) Explain friction welding in detail with its variables. **[8]**

b) Explain the principle and metallurgy of ultrasonic welding? **[8]**

OR

Q12)a) What is High Energy Rate welding process. Explain in brief. **[8]**

b) Explain in brief. "Electron beam welding" process. **[8]**

EEE

Total No. of Questions :8]

SEAT No. :

P2843

[Total No. of Pages :2

[4660]-390
M.E. (Production)
d - SURFACE TREATMENT PROCESSES
(2008 Course) (Elective -III) (Semester - II) (511111)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Discuss various surface dependent properties and its importance in assemblies. **[8]**

b) Discuss the importance and necessity of surface engineering. **[8]**

Q2) a) Explain with neat sketch any two surface coating processes. **[8]**

b) Explain need for surface cleaning and in brief the factors for selection of surface cleaning processes. **[8]**

Q3) a) What is electro deposition and electroless deposition? Differentiate them in brief. **[8]**

b) Expalin in brief the factors for selection of different methods used for surface modification. **[8]**

Q4) Write short notes on any three: **[18]**

a) Different coating materials and their selection.

b) Carbon thin film coating.

c) Surface treatment on advanced materials.

d) Pickling and descaling.

P.T.O.

SECTION -II

Q5) a) Explain with neat sketch and controlling parameter for obtaining desired thickness of Coating for following- **[10]**

i) PVD

ii) Ion implantation

b) Discuss the influence of manufacturing processes on various surface properties of an engineering parts. **[6]**

Q6) a) Explain different ways for evaluation of surface geometry. **[8]**

b) Explain how is the surface geometry of a coated surface is achieved. **[8]**

Q7) a) Discuss different characteristics of engineered surface at different level of scale. **[8]**

b) What is meant by Nano scale? Explain how it will be achieved. **[8]**

Q8) Write short notes on any three: **[18]**

a) Scope of surface engineering in augmentation of surface properties.

b) Tribological characteristics of surface.

c) CVD.

d) Thermal spray coating.

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Total No. of Questions :8]

SEAT No. :

P2844

[Total No. of Pages :2

[4660]-391

M.E. (Production) (Manufacturing & Automation)

a - OPTIMIZATION TECHNIQUES

(2008 Course) (Elective - IV) (Semester - II) (Open) (511112)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Formulate an optimization problem for minimum weight design of a power screw subjected to an axial load F. Pitch (p), major diameter (d), nut height (h) and screw length (s) are design variables Constraints are to ensure that screw should be self locking and shear stress in screw should not exceed shear yield strength of the material. **[8]**

b) Define: **[8]**

i) Integer programming problem.

ii) Stochastic programming problem.

iii) Separable programming problem.

iv) Multi-objective programming problem.

Q2) a) Minimize the function $f(x) = \frac{x}{\log x}$ using Newton-Raphson method. Assume starting point as x=1. **[8]**

b) Explain steps for Fibonacci search method and also draw its flowchart. **[8]**

P.T.O.

Q3) a) Perform two iterations of steepest descent method to minimize the function $f(x) = 4x_1^2 + 3x_2^2 - 5x_1x_2 - 8x_1$. Consider starting point as $x_1 = 0$ and $x_2 = 0$. **[8]**

b) Write the algorithm and draw flowchart for Powell's conjugate direction method. **[8]**

Q4) Write short note on: **[18]**

a) Limitations of Fibonacci methods.

b) Quadratic convergence.

c) Geometric programming.

SECTION -II

Q5) a) Perform two iterations of generalized reduced gradient method to minimize $f(x) = x_1^2 + x_2^2 - 2x_1.x_3$ subject to $g(x) = x_1.x_2 + x_3 - 9 = 0$. Consider starting point as x_1 =2 and x_2 = 4.5. **[10]**

b) Explain the gradient projection method for constrained optimization problems. **[6]**

Q6) Solve following optimization problem using geometric programming

Minimize x_1

Subject to following constraints:

$$-4x_1^2 + 4x_2 \le 1;\ x_1 + x_2 \ge 1;\ x_1, x_2 > 0$$ **[16]**

Q7) a) Calculate the initial temperature for simulated annealing algorithm to minimize the function $f(x) = 2x_1^2 - 4x_1 + x_2^2 - 6x_2 - 8$ for the bounds $3 \le x_1, x_2 \le 8$. **[8]**

b) What is the function value corresponding to the substring 1101 in genetic algorithm to minimize the function $x_1^2 - 3x_2 + 10$ with $0 \le x_1, x_2 \le 3$. **[8]**

Q8) Write short notes on: **[18]**

a) Selection operators in genetic algorithm.

b) Simulated annealing method.

c) Method of feasible direction.

EEE

Total No. of Questions :8]

SEAT No. :

P2845

[Total No. of Pages :2

[4660]-392

M.E. (Production - Manufacturing & Automation)

b - RESEARCH METHODOLOGIES

(2008 Course) (Elective -IV) (Semester - II) (Open) (511112)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) What is Research? What are the objectives of research? **[6]**

b) What are the external research suppliers? **[5]**

c) Distinguish between Research Method and Research Methodology. **[5]**

Q2) a) What are the basic principles of experimental design? **[6]**

b) Describe the features of Response Surface Design. **[5]**

c) What are different complex random sampling designs? **[5]**

Q3) a) What are the types of data to be collected for research? **[6]**

b) What is the difference between a survey and experiment? **[5]**

c) Explain the procedure for selecting a random sample. **[5]**

Q4) Write short notes on any three of the following: **[18]**

a) Randomization and blocking in experimental design.

b) Data collection through questionnaires.

c) Interview method of data collection.

d) Half factorial design of experiments.

e) Measurement scales.

P.T.O.

SECTION -II

Q5) a) Describe briefly the technique of analysis used for one way and two way classification. **[6]**

b) Determine the sample size if random sample is to be drawn from a population of 5600 items to estimate the percent defective within 3% of true value with 95.5% probability. Consider z = 2.005 for confidence level of 95.5%. **[5]**

c) Describe the commonly used sampling distributions. **[5]**

Q6) a) What is multivariate analysis? How does it differ from bi-variate analysis? **[6]**

b) What are the important characteristics of Chi-square test? **[5]**

c) Describe the steps in simulated annealing process with a suitable flow chart. **[5]**

Q7) a) Explain the techniques of interpretation. **[6]**

b) How is crossover operation performed in GA? **[5]**

c) Explain how Neural network method can be used effectively for research. **[5]**

Q8) Write short notes on any three of the following: **[18]**

a) Role of computers in research.

b) Format for report writing.

c) Graph theory approach in decision making.

d) Measures of Central tendency.

e) Oral presentation of Research findings.

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Total No. of Questions : 10]

SEAT No. :

P3333

[Total No. of Pages :3

[4660] - 395
M.E. Production (CAD/CAM)
COMPUTER AIDED DESIGN
(2008 Pattern)

Time : 3 Hours] *[Maximum Marks :100*

Instructions to the candidates:

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

SECTION - I

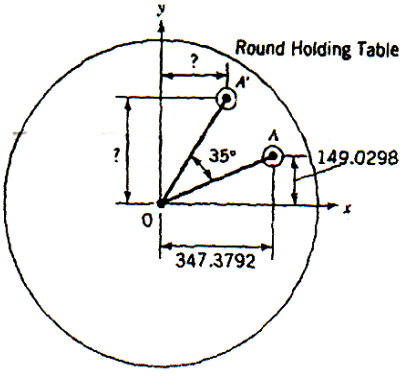
Q1) a) What is Homogeneous Coordinate System? Explain the necessity of Homogeneous Coordinate System for transformation of geometric entities using suitable examples. **[8]**

b) Why parametric representation of geometrical entities are preferred in CAD software? Explain your answer with non-parametric and parametric equations of appropriate geometric entity. **[8]**

Q2) a) Describe briefly the various data exchange systems currently in use.**[8]**

b) Discuss the stages in product life cycle and the importance of each stage. Differentiate between Forward Engineering and Reverse Engineering. **[8]**

Q3) a) Determine the new position of object A placed on a round holding table after the table has been rotated by 35°. **[8]**



P.T.O.

b) Derive the relationship for rasterisation of vectors using the principles of: **[8]**

i) The Digital Differential Analyser (DDA) and

ii) Bresenham's algorithm for the linear interpolation for graphics terminal.

Q4) a) Develop the equation of Bezier curve, find the points on the curve for $t = 0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}$ and 1, and plot the curve for the following data. The coordinates of four control points are given by **[8]**

$V_0 = [0,0,0]$

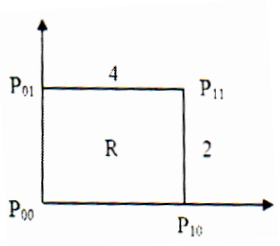
$V_1 = [0,2,0]$

$V_2 = [4,2,0]$

$V_3 = [4,0,0]$

b) Define Explicit, Implicit and parametric representation of geometrical entities and their advantages and disadvantages. **[8]**

Q5) a) Find the equation of B-spline surface that covers the region R? Also, find the surface vectors and its mid-point? **[9]**



b) Explain the procedure of mass property calculations in CAD software. **[9]**

SECTION - II

Q6) a) Find the minimum distance between: **[8]**

i) A point and a surface

ii) A curve and a surface

iii) Two surfaces

b) Compare IGES and STEP. **[8]**

Q7) a) A plane passes through the three points $P_0(1,2,3)$, $P_1(2,4,5)$, and $P_2(4,2,3)$. Find the surface area that is bounded by the parametric domain u = [0,1] and V = [0,1]. Use three point Guass quadrature. **[8]**

b) Why Euler's formula is used in solid modeling? Verify it for tetrahedron and a cube. How can you use a cylinder primitive to generate a sphere? **[8]**

Q8) a) What are the requirements of Engineering Animation? Explain the Keyframe animation technique. **[8]**

b) What are the different techniques used to decide assembling sequence to generate assemblies? **[8]**

Q9) a) Why do we need NURBS? What are the advantages and problems of NURBS? **[8]**

b) Explain various types of surface entities. Derive parametric equation of analytical surface models. **[8]**

Q10) Write short notes on any three **[18]**

a) Parametric programming

b) Virtual realism

c) Hidden surface removal algorithm

d) B-Rep scheme

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Total No. of Questions :8]

SEAT No. :

P2847

[Total No. of Pages :2

[4660]-397
M.E. (Production) (CAD/CAM)
OPTIMIZATION TECHNIQUES
(2008 Course) (Semester - I) (511203)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Formulate an optimization problem for minimum cost of a spring subjected to constraints on deflection to be less than 2 mm Consider wire diameter, coil dimeter, and number of turns as process variables. **[8]**

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. **[8]**

Q2) a) Minimize the function $f(x) = 2x^4 + 4x^3 - 15x^2 + 8$ using golden section method within the bounds of 0 to 2. **[8]**

b) Explain steps for secant method for one dimensional minimization problems. **[8]**

Q3) a) Perform one iteration of steepest descent method to minimize the function $f(x) = 100(x_2 - x_1^2)^2 + (1 - x_1)^2$. Consider starting point as x_1 = -1.2 and x_2 = 1. **[8]**

b) Explain Evolutionary optimization method. **[8]**

P.T.O.

Q4) Write short note on: **[18]**

a) Newton-Raphson method.

b) Integer programming.

c) Fibonacci search method.

SECTION -II

Q5) a) Minimize $f(x) = \frac{1}{3}(x_1 + 1)^3 + x_2$ Subject to: $g_1(x) = -x_1 + 1 \le 0$ and $g_2(x) = -x_2 \le 0$ using interior penalty method. **[8]**

b) Discuss the algorithm for exterior penalty function method. **[8]**

Q6) a) For a minimization problem, using simulated annealing the function value of 120 is updated to new value of 142 at temperature 200°C. What is the probability of accepting the new solution? **[4]**

b) What is the function value corresponding to the substring 10010 in genetic algorithm to minimize the function $3x_1^2 - 8x_2^2 + 6x_1x_2 - 15$ with $1 \le x_1, x_2 \le 4$. **[8]**

c) Limitation of simulated annealing method. **[4]**

Q7) a) Explain nine principles of 'Optimized Production Technology'. **[8]**

b) Explain with suitable example five focusing steps of theory of constraints. **[8]**

Q8) Write short notes on: **[18]**

a) Mutation operators in genetic algorithm.

b) Difference between traditional method and genetic algorithm.

c) Artificial neural networks.

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Total No. of Questions :8]

SEAT No. :

P2848

[Total No. of Pages :2

[4660]-399

M.E. (Production) (CAD/CAM)

b - TRIBOLOGY AND SURFACE ENGINEERING

(2008 Course) (Elective - I) (Semester - I) (511204)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Explain adhesive wear and derive the Archard equation for wear. **[12]**

b) How Rowe modified this equation. **[4]**

Q2) a) Differentiate between Hydrostatic and hydrodynamic bearings. State their applications. **[8]**

b) Derive Petroff's equation. What are its limitations? **[8]**

Q3) a) Derive Reynolds equation with usual notations. **[8]**

b) State and explain pressure distribution in short journal bearing under hydrodynamic conditions. **[8]**

Q4) a) Explain two methods for Surface Topography measurement. **[6]**

b) Explain Bearing performance measurement. **[6]**

c) Write short note on stick-slip Phenomenon. **[6]**

P.T.O.

SECTION -II

Q5) a) Define the term Surface Engineering and discuss its basic requirements with reference to growth of industry. **[8]**

b) Explain Geometrical Parameters of superficial Layer. **[8]**

Q6) a) Give the classification of coatings according to various modes. **[8]**

b) Compare the following:

i) Coated tools with uncoated tools. **[4]**

ii) Diamond coating with TiC coating **[4]**

Q7) a) Discuss service properties of coatings with reference to anti-corrosion and decoration. **[8]**

b) Discuss on selection of coatings for wear and Corrosion resistance with suitable examples. **[8]**

Q8) Describe the principle of working, process parameters and their effects in

a) Physical Vapor Deposition. **[6]**

b) Ion Implantation. **[6]**

c) Sputtering. **[6]**

EEE

Total No. of Questions :8]

SEAT No. :

P2746

[Total No. of Pages :2

[4660]-40
M.E. (Civil Hydraulics)
FLUID MECHANICS
(2008 Course) (Semester - I) (501303)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer booklet.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figure to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data if necessary.***

SECTION -I

Q1) a) Derive 3-D continuity equation in cylindrical polar coordinate system. **[10]**

b) Derive stream function and potential function for a source and superposition of source and sink. **[8]**

Q2) a) Derive Hagen-Poiseuille equation starting with Naier-Stokes equation. **[10]**

b) Oil with density 900 kg/m^3 and viscosity 0.18 N-s/m^2 flows between two horizontal parallel plates 10 mm apart. A constant pressure gradient of -1000 Pa/m drives the flow. The upper plate is moving with a uniform speed, while the lower one is kept stationary. Find the velocity of the upper plate so that **[6]**

i) the flow rate is zero

ii) the shear stress at the upper plate is zero

Q3) a) Derive Boundary Layer equations. **[10]**

b) Explain Boundary Layer Separation describing causes, effects and methods to reduce the thickness. **[6]**

P.T.O.

Q4) Write short notes on (any four): **[16]**

a) Navier Stokes equations

b) Relaxation technique

c) Karman Pohlhausen method

d) Couetee flow and simple Couetee flow

e) Boundary layer over a flat plate

SECTION -II

Q5) a) Derive Reynold's equation of motion. **[10]**

b) Water at 20^oC is flowing through a Hydrodynamically smooth pipe of diameter 20 cm at the rate of 80 lit/s. The average height of roughness projections on the pipe surface is 0.2 m. Determine the **[8]**

i) friction factor

ii) shear stress at the pipe surface

iii) shear velocity

iv) maximum velocity. The density and kinematic viscosity of water at 20^oC are 1000 kg/m^3 and 1 x 10^{-6} m^2/s respectively.

Q6) a) Discuss factors affecting transition from laminar to turbulent flow. **[8]**

b) Write short note on probability density function and distribution function of a continuous random variable. **[8]**

Q7) a) Discuss Isothermal and adiabatic processes. Derive equations for work done by a gas in expanding in adiabatic process. **[8]**

b) Derive equation for stagnation density in compressible flow. **[8]**

Q8) a) Derive Rankine-Hugoniet equation for normal shock wave. **[10]**

b) Define Mach angle, transonic flow, hypersonic flow, shock wave. **[8]**

EEE

Total No. of Questions :8]

SEAT No. :

P2849

[Total No. of Pages :2

[4660]-400

M.E. (Production) (CAD/CAM)

c - INDUSTRIAL ROBOTICS & ARTIFICIAL INTELLIGENCE

(2008 Course) (Elective - I) (Semester - I) (511204)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Define Robot. Explain in brief the components of Robot. **[9]**

b) Explain the following terms associated with robot: **[9]**

i) Accuracy

ii) Repeatability

iii) Robot Work Envelope

iv) Resolution

Q2) a) Explain six degrees of freedom associated with the robot manipulator. **[8]**

b) What are the different drives used in Robot? State the advantages and disadvantages of hydraulic drives in robot. **[8]**

Q3) a) Explain 'WAIT', 'DELAY'. 'SIGNAL', 'DEPART' commands with suitable example. **[8]**

b) Explain various programming methods used in robots. **[8]**

Q4) a) Discuss the gripper design considerations in robotics. **[8]**

b) Classify various types of grippers used in robots. Describe any one of the gripper in detail. **[8]**

P.T.O.

SECTION -II

Q5) a) What do you mean by forward chaining in A.I? Explain with the help of examples taken from real world. Can you use forward chaining in ancestor - tree classification? Why? **[10]**

b) What is the Role of agents in artificial intelligence? Briefly discuss properties of agents. **[8]**

Q6) a) Explain the applications of A.I. **[8]**

b) Explain any two search strategies used in A.I. **[8]**

Q7) a) Differentiate between Proposition logic and Predicate logic. **[8]**

b) Explain the term knowledge, information and intelligence. **[8]**

Q8) a) Explain forward and backward chaining. **[8]**

b) Explain the knowledge engineering process in brief. **[8]**

EEE

Total No. of Questions : 8]

SEAT No. :

P2850

[Total No. of Pages :2

[4660] - 401
M.E. (CAD/CAM) (Semester - I)
CONCURRENT PRODUCT DESIGN
(2008 Pattern) (Elective - I)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain with suitable example different phases in products life cycle **[8]**

b) Discuss technology and technology life cycle. **[8]**

Q2) a) What are the functional requirements for any product design. **[8]**

b) Compare sequential design process with concurrent design process. **[8]**

Q3) a) What are the guidelines considerations for Design for Environment? State the objectives of DFE. **[8]**

b) Discuss different factors influencing in the selection of Material while designing a product. **[8]**

Q4) Write short notes on any three: **[18]**

a) Role of design team elements in concurrent design

b) Design for maintainability and serviceability

c) Axiomatic design for a product

SECTION - II

Q5) a) Explain importance of cost estimation and cost indexes. **[8]**

b) Discuss Life Cycle Cost of product. **[8]**

Q6) a) Discuss role of concurrent engineering in product development. **[8]**

b) Explain the role of supplier in product development. **[8]**

P.T.O.

Q7) a) What is importance of VRML in concurrent product Design. **[8]**

b) Explain how enhancement in the manufacturability & other attributes of electronic products is done by the concurrent engineering. **[8]**

Q8) Write short notes on any three: **[18]**

a) Calculation of total product cost

b) Internet based product design

c) Cost - capacity factors

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P2851

[Total No. of Pages :2

[4660] - 402
M.E. (Production) (CAD/CAM)
A : MECHATRONICS
(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section I and any three questions from Section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assumptions made should be clearly stated and justified***

SECTION - I

Q1) a) Explain what is meant by Mechatronics and appreciate its relevance in engineering design. **[8]**

b) Discuss what do you mean by system and define elements of measurement system **[10]**

Q2) a) Explain various types of velocity and motion sensors **[8]**

b) Describe the performance of commonly used sensors using terms such as range, span, error, accuracy, sensitivity, hysteresis and non-linearity errors **[8]**

Q3) a) Explain transducer signal conditioning process with suitable example. **[8]**

b) What is the output voltage of a 10 bit DAC with a 10.0 V reference if the input is **[8]**

i) $(0010110101)_2 = OB5H$

ii) 20 FH, what input is needed to get a 6.5 V output?

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

a) System modelling

b) Karnaugh map minimization

c) ADC and DAC

d) Traditional design and mechatronics design

P.T.O.

SECTION - II

Q5) a) Describe briefly programming languages used in Programming Logic Controllers **[8]**

b) Device a circuit that can be used with a domestic washing machine to switch on a pump to pump water for 100s into the machine, then switch off and switch on heater for 50 s to heat the water. The heater is then switched off and another pump is to empty the water from machine for 100s **[10]**

Q6) a) Differentiate microprocessor and microcontroller. **[6]**

b) Explain, for a microprocessor, the roles of

i) accumulator,

ii) status,

iii) memory address,

iv) program counter registers

Write pseudocode to represent the following :

1) If A is yes the B, else C

2) While A is yes do B.

Q7) a) Discuss the elements of Data Acquisition and Control System. **[8]**

b) Explain with suitable example mechatronic control in automated manufacturing. **[8]**

Q8) Write short notes on the following : **[16]**

a) Diagnostics and condition monitoring

b) Addressing modes in microprocessor

c) Latching circuit

d) Artificial Intelligence in mechatronics

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P2852

[Total No. of Pages :2

[4660] - 403
M.E. (Production) (CAD/CAM) (Semester - I)
RAPID PROTOTYPING
(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are RP processes strength & limitations. **[8]**

b) Explain three phases of prototyping. Compare these with geometric modeling. **[8]**

Q2) a) Describe advantages of RP in terms of its beneficiaries such as the product designer, tool designer, manufacturing engineer, marketers & consumers. **[8]**

b) Explain Stereo Lithography (SL) with its principle & application. **[8]**

Q3) a) What is meant by operational properties of prototype? Explain in brief. **[8]**

b) Describe the increase in relative complexity of the shape and form of products, project times have been kept relatively shorter? Why? **[8]**

Q4) Write short notes on - Any Three : **[18]**

a) Parts cleaning & finishing in RP process.

b) Selective laser sintering.

c) Environmental Resistance in RP.

d) Fused Deposition system - FDM.

P.T.O.

SECTION - II

Q5) a) Explain in detail application of RP in paleontology & forensic science. **[8]**

b) Explain with suitable example how the design concept of generation of models, from and fit checking and functional testing is done in RP. **[8]**

Q6) a) Explain, what are the application of RP in Biomedical field. **[8]**

b) Explain briefly curved line width function and state its application. **[8]**

Q7) a) Explain, how miniaturization achieved by RP. **[8]**

b) Explain the concept "Alternative approach to RP". **[8]**

Q8) Write short notes on - Any Three. **[18]**

a) The photomodulus model.

b) Laser Additive Non Laser Fabrication.

c) Application of RP in Archeology.

d) Economic Analysis in RP.

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P3267

[Total No. of Pages : 3

[4660] - 405

M.E. (Production Engineering) (CAD/CAM)

CAD/CAM/CAE Software Development

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Discuss the use of general programming interfaces. **[8]**

b) Explain the tools used for customization of CAD software? Discuss object oriented programming (OOP). **[8]**

Q2) a) What is the need for CAD customization? What is mean by customization of CAD software? What are advantages of CAD customization? **[8]**

b) What is API? How to design good API? What it matters? **[8]**

Q3) a) What are the different phases of the system engineering process? Explain each in brief. **[8]**

b) Explain system dependent programming interfaces for pro-programming (Pro-Engineer). **[8]**

P.T.O.

Q4) a) Explain software product development life cycle. **[8]**

b) Discuss the waterfall software process model. **[8]**

Q5) a) Write short note on Application frameworks. **[9]**

b) Discuss the following with reference to software project management: **[9]**

i) Report writing and presentation

ii) Personnel selection and evaluation

iii) Project cost

iv) Project monitoring and review

v) Proposal writing

vi) Project planning and scheduling

SECTION - II

Q6) a) What is Extreme Programming used for rapid software development. **[8]**

b) How software prototyping helps in software development process? **[8]**

Q7) a) Discuss Euler operation with reference to solid modeling. **[8]**

b) What are core issues in rapid software development process? **[8]**

Q8) a) A software is to be developed for drawing and manipulation of line, arc circle and polygon. Design graphical user interface for the same. **[8]**

b) Explain creation of 2D entities in any CAD software using API. **[8]**

Q9) a) What is conventional animation? What are the different steps in used in conventional animation in creation of animated film? **[8]**

b) Explain the basic fundamentals of solid modeling representation in any CAD software **[8]**

Q10) Write notes on any three of the following : **[18]**

a) Automated drafting and dimensioning using customization

b) Software testing

c) Computer aided software engineering

d) User interface design

● ● ●

Total No. of Questions :10]

SEAT No. :

P3280

[Total No. of Pages :2

[4660]-406
M.E. (Production) (CAD/CAM)
COMPUTER INTEGRATED MANUFACTURING
(2008 Pattern) (Semester - II) (511208)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) What is the importance of CIM? Describe application of the CIM in the case of **[8]**

i) Job shop production.

ii) Mass Production? What differences do you find in these two?

b) What are the different levels of Integration against evolution of CIM? Explain. **[8]**

Q2) a) What are the components of PLM software? Explain. **[8]**

b) Describe how the Taguchi technique can be used to evolve a robust design? **[8]**

Q3) a) Prepare a chart showing the data required and data generated in the various sections of a manufacturing Industry. **[8]**

b) What is a relational database? Describe the architecture of database management system. **[8]**

Q4) a) 'PDM is an excellent tool for concurrent engineering'. Elaborate. **[8]**

b) What are the benefits of GT to the manufacturing industry? **[8]**

P.T.O.

Q5) a) What is cellular manufacturing? Discuss various cell formation approaches known to you. **[9]**

b) Discuss how group technology is used in designing manufacturing cells. **[9]**

SECTION -II

Q6) a) What is a FMC? How does FMC ensure flexibility in manufacturing? **[8]**

b) What are the different types of FMS layouts? State factors influencing FMS layouts. **[8]**

Q7) a) Which are the typical sensors that are normally used in robot? Explain. **[8]**

b) Explain the types of Automated storage and retrieval systems (AS/RS). **[8]**

Q8) a) What are the components of small local area network in CIM setup? Explain. **[8]**

b) "Networks are today integral parts of CIM systems, which have made data sharing easy, peripheral changing or interfacing easy and information sharing possible". Comment. **[8]**

Q9) a) Discuss the need and advantages of networking in a manufacturing shop. **[8]**

b) What are the communication interfaces used in computer-to-computer communication? Explain in brief. What are the commonly used interface cards. **[8]**

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

a) Network operating systems.

b) AGV in CIM.

c) Robotic inspection.

EEE

Total No. of Questions : 8]

SEAT No. :

P2853

[Total No. of Pages :4

[4660] - 407
M.E. (Production) (CAD/CAM) (Semester - II)
FINITE ELEMENT ANALYSIS
(2008 Pattern)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section I and any three questions from Section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assumptions made should be clearly stated and justified.***

SECTION - I

Q1) a) Explain the importance of finite element analysis with suitable example. **[6]**

b) Determine the nodal displacements at node 2, stresses in each material and support reactions in the bar shown in Fig. 1. due to applied force $P = 400 \times 10^3$ N and temperature rise of 30°C. Given : $A_1 = 2400$ mm^2 $A_2 = 1200$ mm^2 $E_1 = 0.7 \times 10^5$ N/mm^2 $E_2 = 2 \times 10^5$ N/mm^2 and $\alpha_1 = 22 \times 10^{-6}$/C° $\alpha_2 = 12 \times 10^{-6}$/C° $E = 200 \times 10^5$ N/cm^2. **[12]**

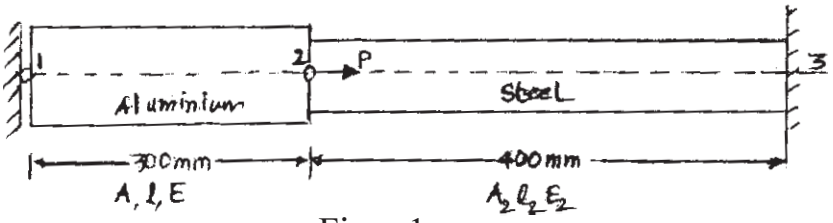

Fig. - 1

Q2) a) Discuss the generalized three dimensional stiffness matrix of a bar Element. **[6]**

P.T.O.

b) Analyze the beam shown in Fig. 2 by finite element method and determine the end reactions. Also determine the deflections at mid spans given $E = 2 \times 10^5$ N/mm^2 and $I = 5 \times 10^6$ mm^4 **[10]**

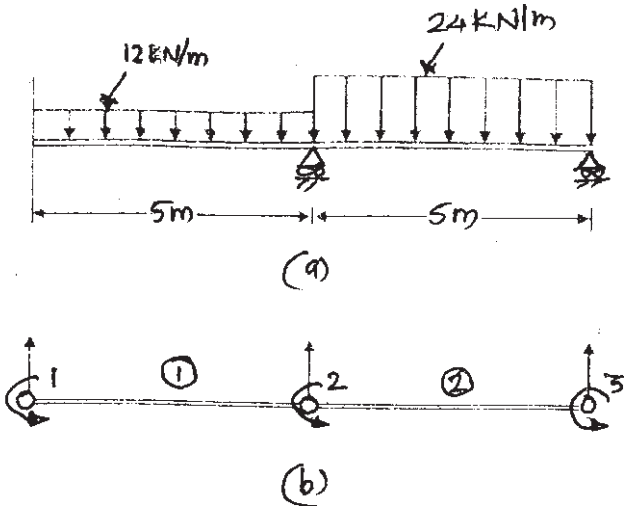

Fig. - 2

Q3) a) Explain the principle of Petro Glarkin's method. **[6]**

b) Determine the extension of the bar shown in Fig. 3 due to self weight and a concentrated load of 400 N applied at its end. Given $b_1 = 150$ mm $b_2 = 75$ mm $t = 20$ mm $E = 2 \times 10^5$ N/mm^2 $\rho = 0.8 \times 10^{-4}$ N. **[10]**

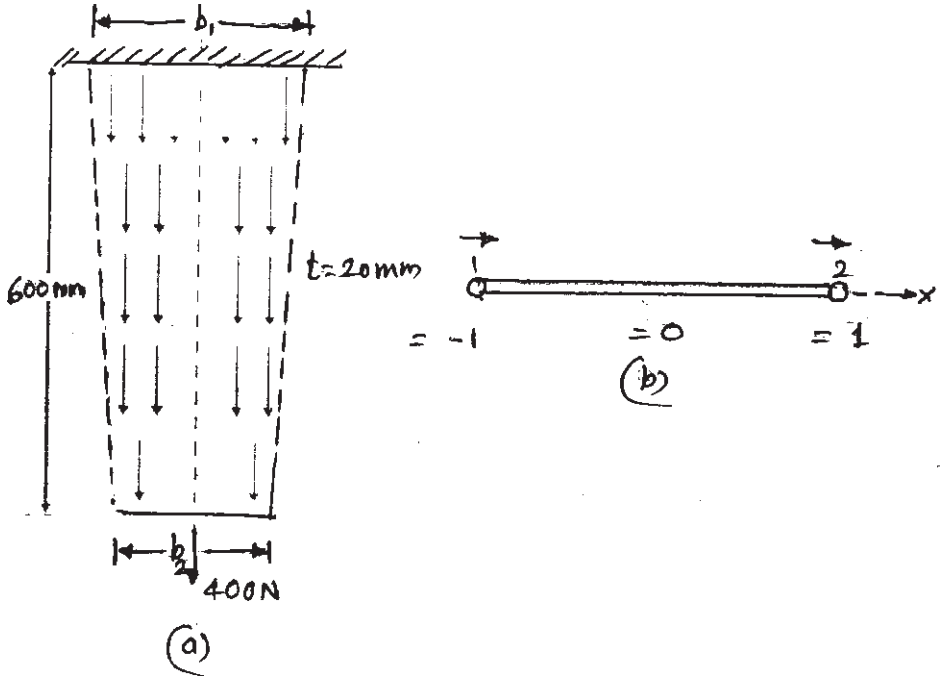

Fig. - 3

Q4) a) Derive Lagrange's quadratic interpolation function in Cartesian Co - ordinate system using the properties of shape function. **[8]**

b) Write short notes on (Any two) **[8]**

i) Shape function and interpolation function.

ii) Connectivity conditions.

iii) Sources of error.

iv) P, h & p - h methods.

SECTION - II

Q5) a) Solve the Differential equation by using any two methods. **[12]**

$$\frac{d^2u}{dx^2} + 9u - 6x = 0 \text{ BC.s : } u(0) = 0 \quad u(1) = 0$$

i) Finite Difference Method

ii) Weighted residual method

iii) Sub-domain method

iv) Galerkin method

b) Derive stiffness equation for a spar element oriented arbitrarily in a 2 - dimensional plane. **[6]**

Q6) a) Define : Plane Truss. Orientation of Transformation matrix. pin joint. Roller support. **[6]**

b) Analyze the plane truss completely. E = 400 GPa, A = 20 cm^2 Refer Fig. 4. **[10]**

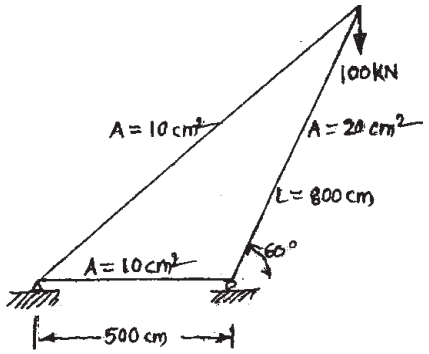

Fig. - 4

Q7) a) State Hamilton's principle and derive an expression for equilibrium. **[6]**

b) Fig. 5 shows an indeterminate pin connected plane stress with cross sectional area of diagonal members equal to 2000 mm^2 and all other members with cross sectional area of 1000 mm^2. If Young's modulus E = 200 kN/mm^2. **[10]**

i) Assemble global stiffness matrix

ii) Determine load vector if temperature of member 1 – 3 increases by 25°C. Given $\alpha = 12 \times 10^{-6}$/°C

iii) Determine load vector if member 1 – 3 is longer by 0.2 mm.

iv) Introduce Boundary Conditions

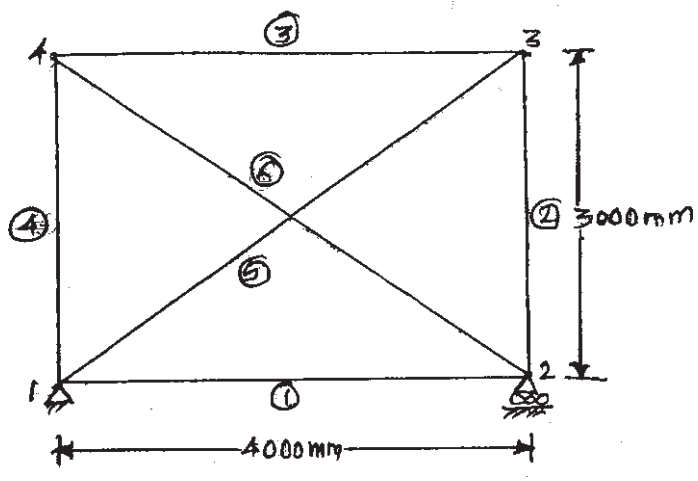

Fig. - 5

Q8) Attempt any two : **[16]**

a) Mesh generation techniques.

b) FEA Package.

c) Differentiate between Isoparametric and nonlinear element.

d) Differentiate between the terms 'lumped loads' and consistent loads.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P2854

[Total No. of Pages :3

[4660] - 408
M.E. (Production) (CAD/CAM) (Semester - II)
ADVANCED MATHEMATICS
(2010 Pattern)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Reduce the quadratic form $2x_1x_2 + 2x_1x_3 - 2x_2x_3$ to the canonical form by an orthogonal reduction and discuss its nature. Also find the modal matrix. **[8]**

b) If $A = \begin{bmatrix} 0 & 1+2i \\ -1+2i & 0 \end{bmatrix}$ show that $(I - A)(I + A)^{-1}$ is a unitary matrix. **[8]**

Q2) a) Find the curve on which the functional $\int_0^1 [(y')^2 + 12xy]dx$, with $y(0) = 0$ and $y(1) = 0$ can be extremised. **[8]**

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) Find the Fourier transform of e^{-x^2}. **[8]**

b) Solve by the method of Laplace transform the equation $y''' + 2y'' - y' - 2y = 0$ with $y(0) = y'(0) = 0$ and $y'(0) = 6$. **[8]**

P.T.O.

Q4) a) Solve the integral equation : **[6]**

$$\int_0^{\infty} f(x)\cos\lambda x\,dx = e^{-\lambda}$$

b) Show that the transformation **[6]**

$$y_1 = x_1 - x_2 + x_3$$

$$y_2 = 3x_1 - x_2 + 2x_3$$

$$y_3 = 2x_1 - 2x_2 + 3x_3$$

is regular, write down the inverse transformation

c) Two masses M_1 and M_2 are connected by an inextensible string which passes over a fixed pulley, Using Langrange's equations show the acceleration of either mass is numerically = $(m_1 - m_2)g/(m_1 + m_2)$. **[6]**

SECTION - II

Q5) a) A tightly stretched Flexible string has its ends fixed at x = 0 and x = l, At a time t = 0, the string is given a shape defined by $f(x) = \mu x(l - x)$, where μ is a constant and then released, find the displacement of any point x of the string at any time t > 0. **[9]**

b) The ends A and B of a rod 20 cm long have the temperature at 30° C and 80°C until steady state prevails. The temperature of the ends are changed to 40°C and 60°C respectively. Find the temperature distribution in the rod at time 't'. **[9]**

Q6) a) Describe in brief types of simulation approaches. **[8]**

b) Discuss the state variable model and its advantage's over differential equation model. **[8]**

Q7) a) A random variable X has uniform distribution over (–3, 3), find 'k' for which $p(x > k) = \frac{1}{3}$. Also evaluate $p(x < 2)$ and $p[|x - 2| < 2]$ **[8]**

b) The height of six randomly chosen sailors are (in inch) : 63, 65, 68, 69, 71, 72. Those of 10 randomly chosen soldier's are 61, 62, 65, 66, 69, 69, 70, 71, 72, 73. Discuss the light that these data thrown the suggestions that sailors are on the average toller than soldier's. **[8]**

Q8) a) For a chi - square distribution with n.d.f. establish the following recurrence relation between the moments.

$\mu_{r+1} = 2r(\mu_r + n\mu_{r-1}), r \geq 1$. Hence find β_1 & β_2. **[9]**

b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for, **[9]**

$0 < x < \pi, 0 < y < \pi$, given that

$u(0, y) = u(\pi, y) = u(x, \pi) = 0, u(x, 0) = \sin^2 x$

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P2855

[Total No. of Pages :2

[4660] - 409
M.E. (Production) (CAD/CAM) (Semester - II)
PRODUCT LIFE CYCLE MANAGEMENT
(2008 Pattern) (Elective - III)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Why & How PLM is implemented? And explain its benefits. **[8]**

b) How PLM strategy developed & implemented to achieve a PLM vision. **[8]**

Q2) Write short notes on **[18]**

a) Design for Manufacturing

b) Concurrent Engineering.

c) Design for Six Sigma

Q3) a) Define product modeling & Explain its fundamental issues. **[8]**

b) Explain effect of standardization in product modeling. **[8]**

Q4) a) Explain in short integrated product development process. **[8]**

b) Explain & State the guidelines of 'Design for assembly'. **[8]**

P.T.O.

SECTION - II

Q5) a) In DFM explain the 'Rules of Thumb' or 'Design Rules' that are used to reduce the cost of component. **[8]**

b) What factors are considered to reduce the cost of assembly? **[8]**

Q6) a) What are the basic reasons of implementing Product Data Management (PDM) system? **[8]**

b) Explain Taguchi method for design of experiment. **[8]**

Q7) a) What is mean by intelligent information system? Explain it. **[8]**

b) Explain how soft computing facilities are used in product development process. **[8]**

Q8) Write short notes on any three **[18]**

a) FMEA.

b) Architectures of PDM.

c) Advanced Database Design for Integrated manufacturing.

♦♦♦♦

Total No. of Questions :8]

SEAT No. :

P2747

[Total No. of Pages :2

[4660]-41

M.E. (Civil) (Hydraulics)

a - REMOTE SENSING AND GIS IN WATER RESOURCES ENGINEERING

(2008 Course) (Semester - I) (Elective - I) (501304)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

SECTION -I

Q1) a) Define remote sensing? Explain the principle of remote sensing with neat sketch. **[6]**

b) Describe the concept of Electromagnetic Spectrum with neat sketch. **[6]**

c) Write note on: **[4]**

i) Geostationary and Sun-synchronous satellites and

ii) Across track and along track multispectral scanners.

Q2) a) What do you understand by False Colour Composites (FCC)? Mention its advantages. **[6]**

b) What is difference between aerial photographs and remote sensing image? **[6]**

c) Write a note on Atmospheric window. **[4]**

Q3) a) Discuss in detail the fundamental (energy) equation for conceptual design of Remote Sensing. **[6]**

b) Write a brief on spectral signature. **[6]**

c) What are the elements of interpretation of remote sensing images. **[6]**

P.T.O.

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

a) Spatial Resolution

b) Spectral Resolution

c) Radiometric Resolution

d) Image classification

SECTION -II

Q5) a) What is GIS? Explain in detail components of GIS? **[6]**

b) Discuss regarding the linkage of GIS to Remote Sensing. **[6]**

c) What is meant by data in GIS? State difference between vector and raster data. **[4]**

Q6) a) Write a note on DBMS. **[6]**

b) Discuss in short Data analysis. **[6]**

c) Define datum and bring out concept of datum transformation. **[6]**

Q7) a) What is projection? Comment in brief of choice and limitations of projections. **[6]**

b) Explain application of Geo Informatics with working flow charts in irrigation and drainage surface runoff estimation. **[6]**

c) Enlist various GIS softwares. Discuss in brief features of any one software. **[4]**

Q8) Write short notes on: **[16]**

a) TIN

b) Vector and Raster Model

c) Errors in GIS

d) Various GIS tasks / functions

EEE

Total No. of Questions : 08]

SEAT No. :

P2856

[Total No. of Pages :2

[4660] - 410
M.E. (Production CAD/CAM)
B : ADVANCED MATERIALS AND PROCESSING
(2008 Pattern) (Elective - III) (Semester - II)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What is tool steel? How does the AIST-SAE designation system for tool steel differ from that for plain carbon and alloy steel? **[7]**

b) What are the methods of heat treatments of non-ferrous alloys and stainless steel? **[6]**

c) What is supper alloy? What metals or combinations of metals form the base of the supper alloy? **[5]**

Q2) a) What are bio-ceramics and bio-plastics? Explain their properties and applications. **[8]**

b) What are metallic glasses? Why is the word 'glasses' used for these materials? Explain how it is produced? What are their properties and applications? **[8]**

Q3) a) What are some ceramics materials that are currently being used for the cutting tool application and what features or properties make them attractive? **[8]**

b) Explain different types of ceramics with their characteristics and applications. **[8]**

P.T.O.

Q4) a) What is supper conductor? What are the types of supper conductors and how HTSC are produced? **[6]**

b) Why an aircraft skins made of aluminium alloys even though magnesium is the lightest metal? **[6]**

c) What effect does additives have on polymer? **[6]**

SECTION - II

Q5) a) Explain with suitable example CVD &PVD. **[8]**

b) What are SMC and BMC? **[8]**

Q6) a) Explain the principle of LBM with process parameter, advantages, disadvantages and application. **[8]**

b) What are the process parameters of USM? And what are their effects on process? Explain with sketch. **[8]**

Q7) a) What is electrochemical grinding? Explain it with sketch. **[8]**

b) Explain the difference between honing, lapping and super finishing with sketch. **[8]**

Q8) a) Explain principle of magnetic abrasive finishing process and also state its salient features. **[6]**

b) Explain ECM with sketch. **[6]**

c) What are different liquid state fabrication methods? Explain. **[6]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P3281

[Total No. of Pages :3

[4660]-411

M.E. (Production) (CAD/CAM)

c-MANUFACTURING SYSTEM DESIGN

(Elective-III) (2008 Course) (Semester-II) (511211)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain with specific reasons, why system yield is lower than machine cycle in a manufacturing system. **[8]**

b) What characteristics attributable to *design* and *manufacturing* contribute to the quality of a manufactured product? Why do machining operations have an optimum (non-zero, non-infinite) cutting speed? **[8]**

Q2) a) Explain the following: **[8]**

i) Mass Customization

ii) Modes of Production

b) Discuss the attributes and appropriate applications for the different transmissions used in machine tools. What are the motivations for introducing automation into a manufacturing system? **[8]**

P.T.O.

Q3) a) What is a route sheet. What is the difference between a basic process and a secondary process. Explain the term precedence constraint in process planning. **[8]**

b) Suppose a turning operation is to be performed with HSS tooling on mild steel, with Taylor tool life parameters $n = 0.125$, C =70 m/min. The work part has length =500 mm and diameter =100 mm. Feed = 0.25 mm/rev. Handling time per piece =5.0 min, and tool change time =2.0 min. Cost of machine and operator =Rs. 1500. hr, and tooling cost = Rs. 150 per cutting edge. Find **[8]**

i) Cutting speed for maximum production rate, and

ii) Cutting speed for minimum cost

Q4) a) What are the criteria for evaluation of manufacturing optimization? Explain? **[10]**

b) Define the terms 'Average Cycle Time', 'Throughput Rate' 'Reentrant Flow' and 'Work in Process' in Manufacturing System design? **[8]**

SECTION-II

Q5) a) Explain the role of simulation in manufacturing system design? Explain with an example? **[8]**

b) Explain the general design framework and evaluation procedures used in simulation of manufacturing systems? **[8]**

Q6) a) Define 'Group Technology' and 'Part Family'. What is the composite part concept in Group Technology. **[8]**

b) What is a flexible manufacturing system. What makes an automated manufacturing system flexible? Name some of the FMS software and control functions. **[8]**

Q7) a) Distinguish between Lean Manufacturing and Agile Manufacturing (any six features) with examples. **[8]**

b) Explain the following database structures: **[8]**

i) Hierarchical

ii) Network

iii) Relational

Q8) Write a short note on any three of the following: **[18]**

a) Automatic data collection systems.

b) Hollier method for GT cell layout.

c) Computer systems in manufacturing system analysis.

d) Criteria for Line Balancing.

□□□□

Total No. of Questions : 8]

SEAT No. :

P2857

[Total No. of Pages :2

[4660] - 412
M.E. (Production) (CAD/CAM)
QUALITY & RELIABILITY ENGINEERING
(2010 Pattern) (Semester - II)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section - I and any three questions from Section - II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assumptions made should be clearly stated and justified.***

SECTION - I

Q1) a) Describe parameter design strategy. **[6]**

b) Explain Taguchi's perspective of quality as a loss function. **[10]**

Q2) a) Discuss the steps in designing performance in product or process. **[6]**

b) A bread-stuffing producer is comparing the calorie content of the original process with a new process. Which has the lower content and what is the difference? Results are: **[10]**

Original	130	135	128	127
Light	115	112	120	113

Q3) a) Explain Type I and Type II errors in hypothesis testing. **[8]**

b) Identify parameters affecting surface finish of work piece turned on lathe machine and carry out parameter design to improve the process parameters. **[10]**

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

a) Concept of orthogonal array

b) Tolerance design

c) Crossed array experiments

d) First - Order And Seconder - Order Models

P.T.O.

SECTION - II

Q5) a) Define reliability, availability and maintainability. Explain their significance in product/process development. **[8]**

b) Explain the concept of FMECA and its advantages as compared with the why-why analysis. **[8]**

Q6) a) Define: MTTF, MTBF, FMECA, FTA **[8]**
Assume that a product has a constant failure rate of $\lambda = 0.002$ per hour. What is the probability that it will survive or be reliable during the first 100 hours of operation?

b) Draw the failure rate curve for industrial product and explain its shape. **[8]**
An element has a probability of successful operation over a given period of 60%. If such elements are connected in parallel estimate the improvement factor.

Q7) a) Explain system reliability and its types in detail. **[8]**

b) Describe the various approaches available to increase the reliability of

i) Single component system.

ii) Multiple component complex system.

It is desired to have a reliability of at least 0.990 for a specified service period of 8,000 hours on the assumption of a uniform failure rate, what is the least value of θ that will yield this desired reliability? **[10]**

Q8) Write short notes on the following: **[16]**

a) Maintained system

b) Condition monitoring

c) Time - dependent Hazard models

d) K-out-of-m models

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Total No. of Questions : 8]

SEAT No. :

P3282

[Total No. of Pages : 2

[4660] - 413
M.E. (Production) (CAD/CAM)
COMPUTER AIDED PRODUCTION PLANNING
(2008 Pattern) (Semester - II) (Elective - IV)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Best company has the following sales pattern during 2008 to 2014. Compute the sales forecast for 2015. **[8]**

Year	2008	2009	2010	2011	2012	2013	2014
Sales (in Lakhs)	35	44	61	74	91	87	108

b) Discuss OPITZ classification system of GT. **[8]**

Q2) a) Explain rank order clustering (ROC) algorithm for GT. **[8]**

b) Briefly explain ALDEP for facility layout. **[8]**

Q3) a) What are the major modules of process planning software and the database required? **[8]**

b) Discuss operations management with schematic representation. **[8]**

P.T.O.

Q4) a) Explain mathematical model for machine component cell formation. **[9]**

b) Discuss the major non-contact inspection methods. **[9]**

SECTION - II

Q5) a) Which factors are considered for selecting an ERP package? **[8]**

b) What is master production schedule? Why it is essential for MRP? **[8]**

Q6) a) A foreman wants to machine four different jobs on three machines. The sequence of operation for all the four jobs is shaping-drilling-tapping. The machining time for all the jobs on three machines are given in table below. **[8]**

Job	Machining time (min)		
	Shaping	Drilling	Tapping
A	15	7	19
B	20	12	8
C	12	11	17
D	24	9	12

Find the sequence in which the job should be machined so as to minimize the total time of all the four jobs. Show the optimal schedule on a Gantt chart.

b) Briefly explain shop floor data collection system. **[8]**

Q7) a) Explain briefly the types of simulation. **[8]**

b) Describe procedure of simulation using simulation package. **[8]**

Q8) Write short notes on. **[18]**

a) Heuristics to production scheduling.

b) Generic model for ERP system.

c) Manufacturing resource planning.

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Total No. of Questions : 08]

SEAT No. :

P2858

[Total No. of Pages :2

[4660] - 414
M.E. (Production CAD/CAM) (Semester - II)
TECHNOLOGY MANAGEMENT
(2008 Pattern) (Elective - IV(b))

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) "Management of Technology links engineering, science and management disciplines to plan, develop and implement technological capabilities to shape and accomplish the strategic and operational objectives of an organization". Explain in brief. **[8]**

b) What are the principles for developing technology strategy. **[8]**

Q2) a) Explain in brief various steps the organizations take for promotion of creativity & innovation. **[8]**

b) Explain the following : **[8]**

i) Compare Process technology and product technology

ii) Critical issues in technology management.

Q3) a) Explain the various channels of technology transfer? **[8]**

b) Explain in detail the challenges in promoting the appropriate technology. **[8]**

Q4) Write SHORT NOTES on any THREE **[18]**

a) Management of Technology Models.

b) Issues of commercialization of research.

c) Factors in technology transfer

d) Integration of technology and management.

P.T.O.

SECTION - II

Q5) a) What are broad steps to be followed in procedure for world patenting? **[8]**

b) Describe the role of WTO in international business. **[8]**

Q6) a) What are the objectives of innovation foundation? What are recent government policies for it? **[8]**

b) Explain your views on central government policy for "Make in India". **[8]**

Q7) a) Discuss co - relations for functional capability and level of innovation in technology assessment. **[8]**

b) Explain the procedural steps followed in Analytical Hierarchical Process (AHP) with an example. **[8]**

Q8) Write SHORT NOTES on any THREE. **[18]**

a) IPR

b) Items which can be patented

c) Technological leadership

d) Limitations of AHP

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Total No. of Questions : 12]

SEAT No. :

P2859

[Total No. of Pages :2

[4660] - 415

M.E. (Production) (CAD/CAM) (Semester - II)

DESIGN OF EXPERIMENTS AND RESEARCH METHODOLOGY

(2010 Pattern) (Elective - IV)

Time : 3 Hours] *[Maximum Marks : 100*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2; Q.3 or Q.4 and Q.5 or Q.6 from section - I.***
2) ***Answer Q.7 or Q.8 and Q.9 or Q.10 and Q.11 or Q.12 for section - II.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in brief difference between mathematical research and experimental research. **[8]**

b) Explain research process with flow chart. **[8]**

OR

Q2) a) Explain steps and its significance of each for research methods. **[8]**

b) Explain Objective of research. **[8]**

Q3) a) What are the techniques of interpretation? **[8]**

b) Explain formulating research problem. **[8]**

OR

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

a) Criteria of good research.

b) Motivation in research.

c) Problem solving process.

d) Brain Storming and Delphi method.

Q5) a) Explain Data consideration and testing of models. **[8]**

b) Explain simulation in terms of Meaning, Application, and Classification of Models. **[10]**

P.T.O.

OR

Q6) a) Explain process of simulation with steps and features and validation process. **[8]**

b) Explain use of analogy, data consideration and model testing. **[10]**

SECTION - II

Q7) a) What are the objectives of experimentation? **[8]**

b) What are the steps in design of experimentation? **[8]**

OR

Q8) a) Explain Replication randomization and blocking. **[8]**

b) Explain factorial experimental design. **[8]**

Q9) a) Explain Taguchi approach to parameter design. **[8]**

b) Explain the process of Analytical Hierarchy Process for carrying out decision making amongst alternative options. **[8]**

OR

Q10) a) Explain application of experimental design. **[8]**

b) How the genetic algorithm tool is used for optimizing the decision making criteria and for getting the better result. **[8]**

Q11) a) Explain format in report writing. **[8]**

b) Explain Univariate and Bivariate analysis with suitable example. **[10]**

OR

Q12) a) Explain a Hypothesis Testing Parametric and Non Parametric approach with suitable Examples. **[10]**

b) What precaution one has to take while writing the research report? **[8]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P3483

[Total No. of Pages : 2

[4660] - 416

M.E.

COMPUTATIONAL FLUID DYNAMICS

(Elective - IV)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve Section - I and Section - II in separate answer books.***
2) ***Solve any three Questions from each section.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is CFD? How does CFD help solve the problems of fluid mechanics? **[8]**

b) Explain Finite difference numerical discretization method? **[8]**

Q2) a) Discuss differential and integral forms of the general transport equations. **[10]**

b) How do you treat viscous flows and inviscid flows in CFD? **[6]**

Q3) a) Explain steady one-dimensional convection and diffusion. **[8]**

b) Discuss central difference schemes for convection - diffusion problems. **[8]**

Q4) Write short note on any three of the following : **[18]**

a) FVM method in CFD

b) Basic equations of fluid dynamics

c) Stability in terms of Courant number

d) Upwinding scheme

P.T.O.

SECTION - II

Q5) a) Discuss elliptic nature of inviscid flows at low Mach Number. **[8]**

b) Discuss the potential equation for steady, isentropic, inviscid compressible flows. **[8]**

Q6) a) Discuss Numerical solution procedure for viscous incompressible flows. **[8]**

b) Discuss the main features of the SIMPLE algorithm. **[8]**

Q7) a) How do you use standard codes to predict fluid flow and heat transfer? Discuss. **[10]**

b) Explain in brief the High and low Reynolds number models. **[6]**

Q8) Write short note on any three of the following : **[18]**

a) Characteristic form of equations in inviscid flows

b) The continuity equation divergence constraint

c) Poisson equation of pressure for incompressible flows

d) K-I Models

Total No. of Questions : 8]

SEAT No. :

P2860

[Total No. of Pages : 3

[4660] - 417

M.E. (Computer) (Common to Computer Engg. & Comp. N/W)

APPLIED ALGORITHMS

(2008 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) A binary tree is a rooted tree in which each node has at most two children. Show by induction that for any binary tree, the number of nodes with two children is exactly one less than number of leaves. **[10]**

b) Prove the following by Mathematical induction. **[8]**

i) $C(n, 0) + C(n, 1) + C(n, 2) + ...+ C(n, n) = 2^n$.

ii) $C(n, 0) – C(n, 1) + ... + (–1)^1 C(n, i) + ...+ (–1)^n C(n, n) = 0$

Q2) a) Consider the following code segment : search (int n, int *x*)

```
{
  int t [max] ;                    // array holding max integers
  int t, x ;
  t [o] = x ;                      // t [o] is used as marker
  i  = n ;
  while (t [i] ! = x)
          i = i – 1;
  if (i > 0) then
    PrintF (“Found”);
  else
     PrintF (“Not Found”);
  }
```

Assume uniform distribution and determine average search time for successful search. **[6]**

P.T.O.

b) In case of analyzing an algorithm, in what way, the amortized constant time differs from constant time on the average. **[4]**

c) Compare the sorting methods merge sort and quick - sort, device datasets which compare the average and worst case complexities for the two algorithms. **[6]**

Q3) a) Write an algorithm for Depth first search algorithm in Graph using suitable data structure. What is the complexity of the algorithm? If we have not used this data structure can still we implement the same algorithm, if yes what is its complexity? **[8]**

b) Assume that you have functions F and g such that F (n) is O (g(n)) for each of the following statement, decide whether you think it is true or false. **[8]**

i) $\log_2 F(n)$ is O ($\log_2 g(n)$)

ii) $2^{f(n)}$ is O ($2^{g(n)}$)

Q4) a) Determine the running time of quick sort for **[8]**

i) Sorted input

ii) Random input

When pivot element is chosen as.

1) The first element

2) A random element

b) Show that if all internal nodes in a tree have degree K then the number of external nodes n is such that n mod (K–1) = 1. **[8]**

SECTION - II

Q5) a) Write an algorithm for finding Hamiltonian cycle in an undirected graph. How do you claim that, this algorithm is probabilistically good algorithm. **[8]**

b) Explain the following with respect to approximation algorithm. **[8]**

i) Approximate scheme

ii) Polynomial time approximation scheme

iii) Fully polynomial time approximation scheme.

Q6) a) Design on Dynamic programming algorithm for n matrices A1, A2, ...An of dimension P1 * P2, P2 * P3 ..... Pn * Pn + 1, respectively our goal is to compute the matrix product A1, A2, ... An in an order such that it would take the minimum number of computations to derive the product. **[10]**

b) Write CRCW and EREW algorithms for parallel computers. **[8]**

Q7) a) State prefix computation problem. Write parallel algorithm for the same. Find the time complexity of this algorithm. **[8]**

b) What is Dynamic programming approach to solve the problem? Explain with suitable example. **[8]**

Q8) Write notes (any 4) : **[16]**

a) Prefix Computation

b) Dynamic programming Vs recursion

c) Pointer doubling problem

d) PRAM model

e) Probability function & discrete probability space

Total No. of Questions : 8]

SEAT No. :

P2862

[Total No. of Pages : 2

[4660] - 419

M.E. (Computer Engg. & Computer Network)

PRINCIPLES AND PRACTICES FOR IT MANAGEMENT

(2008 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What should be the goals, objectives and targets of management information system? **[4]**

b) How can the information technology help in imbibing the social responsibility in the country. Give your suggestions. **[6]**

c) Explain role and importance of management and the process of management with specific relation to IT management. **[6]**

Q2) In the ship operations, noise monitoring is important. We have nowadays electromechanical system to carry out this. But your shipping company decided to upgrade that & use current technology of wireless sensor networks. For this, you are working as manager. You have decided to deploy appropriate motes(nodes) to sense vibrations of the machineries and then after some signal processing, the information will be forwarded to a sink node. From there it will be transmitted to company webserver via satellite. The officer in charge on the ground will take appropriate action to control total noise pollution on board and in the sea. **[16]**

Write down WBS for above mentioned project

a) Create the PND

b) Write down the project plan

c) Provide your action plan for the delay

P.T.O.

Q3) a) What is meant by "risk"? Comment on risk management in IT projects. **[8]**

b) Discuss the methods to handle project change in a project plan. **[8]**

Q4) a) Discuss project status collecting tools. **[4]**

b) Discuss the challenges of implementing a short-term project. **[4]**

c) Discuss qualities required for a team leader. **[4]**

d) How will you define the project goals and prioritize them? **[6]**

SECTION - II

Q5) a) How will you deal with teams as an IT Project Manager. **[6]**

b) Explain different views of conflict. How will you manage conflicts in IT projects? **[10]**

Q6) a) What are the reasons leading to stress in business organization? How can it be taken care of? **[8]**

b) Explain. "Process & Project quality standards-Six Sigma". **[8]**

Q7) a) Explain the possible reasons for requirement of review of I.T. projects. **[8]**

b) Discuss the importance of Cyber Laws with regards to the latest revelations in the global scenario. What sort of safety aspects can be implemented to avoid piracy of strategic information? **[10]**

Q8) Write short notes on : **[16]**

a) Formal and Informal Groups

b) Energy Audit

c) CMMI

d) IPR

Total No. of Questions :8]

SEAT No. :

P2748

[Total No. of Pages :2

[4660]-42
M.E. (Civil) (Hydraulics)
b - DAM ENGINEERING
(2008 Course) (Elective - I) (Semester - I) (501304)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Indicate the various assumptions made in two dimensional stability analysis for design of gravity dams. Outline the steps for two -dimensional analysis by analytical method. **[6]**

b) Write a brief note on the necessity and method of foundation treatment of dams. **[4]**

c) Discuss a typical schedule of operations for a multi purpose reservoir with the help of neatly labelled sketch. **[8]**

Q2) a) Enumerate the design theories that are used in the design of arch dam, which of these theories are used to compute approximate result and which one is used for obtaining precise results? Explain any one of these theories in a nut-shell. **[8]**

b) Differentiate between 'introdos' and 'extrodos' as applicable in arch dam. **[4]**

c) Discuss various forces acting on arch dam. **[4]**

Q3) a) Explain the points to be considered while checking the design of earth dam in earthquake regions. **[4]**

b) Derive the equation for the discharge through the body of an earth dam with horizontal filter at downstream end. If the flownet of the dam is known, derive an alternative expression for its discharge through the body of the dam. **[12]**

P.T.O.

Q4) a) Explain with the help of sketches, the different types of rockfill dams. **[4]**

b) Discuss the principle factors which govern the desing criteria of rockfill dam. **[12]**

SECTION -II

Q5) a) Enumerate the different types of buttress dams; and explain as to how a slab type buttress dam differs in its design as compared to a concrete gravity dam with the help of sketches. **[10]**

b) Explain why 'massive head type of buttress dams' are considered to be the best of all available types of buttress dams? **[6]**

Q6) a) Enumerate the various factors affecting the capacity and design of spillways. **[4]**

b) Explain how the inter-relationship, between the 'jump height curve' and 'tail water curve' decides the type of energy dissipation arrangement required below an overflow spillway. **[10]**

c) What do you understand by siphon spillway? Draw a sketch of a saddle siphon spillway and explain the functions of its various components. **[4]**

Q7) a) List different types of spillway crest gates. Explain working of any one with a suitable sketch. **[6]**

b) Describe with a neat sketch, the construction and working of a 'radial gate' and 'drum gate'. **[10]**

Q8) Write short notes on any four of the following: **[16]**

a) Automatic gates.

b) Side channel spillway.

c) Priming devices for siphon spillways.

d) Slope protection in earthen dams.

e) Shear keys in concrete gravity dams.

E E E

Total No. of Questions : 8]

SEAT No. :

P2863

[Total No. of Pages : 2

[4660] - 420
M.E. (Computer Engineering)
ADVANCE SOFTWARE ENGINEERING (Elective - I(a))
(2008 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Define Software Engineering and Software process model. Explain the activities of Software development life cycle. **[8]**

b) Explain the tasks of requirements engineering process. **[8]**

Q2) a) What is Software Architecture Design? Explain any two architectural styles. **[8]**

b) What is object oriented design? How do you develop object models using UML? Explain with an example. **[8]**

Q3) a) Explain the component based software development process. **[8]**

b) What is a critical system? Explain the techniques for achieving dependability of software. **[8]**

Q4) Explain the following.(Any three) : **[18]**

a) Use case model

b) System Engineering

c) Evolutionary process model

d) Risk analysis

P.T.O.

SECTION - II

Q5) a) Differentiate between black box and white box testing. Explain the testing process. **[8]**

b) What is function point? How it is used in estimation of software cost? **[8]**

Q6) a) Explain the Extreme programming process. **[8]**

b) Explain a formal method specification with an example. **[8]**

Q7) a) Explain size oriented and function oriented metrics. **[8]**

b) Explain risk management tasks. **[8]**

Q8) Explain the following (Any three) : **[18]**

a) Path testing

b) Team Structure

c) Quality factors

d) Change Management

Total No. of Questions : 8]

SEAT No. :

P2864

[Total No. of Pages : 2

[4660] - 421
M.E. (Computer Engineering) (Semester - I)
INTELLIGENT SYSTEMS (Elective - I)
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from Section - I and Section - II.***
2) ***Assume suitable data, if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Describe the goal-based agent's structure with a suitable example. **[8]**

b) Write PEAS description for Playing a tennis match and Performing a high jump also Explain the properties of task environment for each suitable agent design. **[10]**

Q2) a) Define problem formulation? Describe the components of a problem with a suitable example. **[8]**

b) Describe Measuring problem-solving performance with a suitable example. **[8]**

Q3) a) Prove that A* search is complete, optimal, and optimally efficient among all such algorithms is rather satisfying. **[8]**

b) Write a Hill-climbing algorithm for solving the traveling salesperson problem (TSP) is a touring problem in which each city must be visited exactly once. **[8]**

P.T.O.

Q4) a) Explain following terms in simple planning. **[8]**

i) Representation of actions

ii) Representation of states

iii) Representation of goals and

iv) Representation of plans.

b) Explain Situation space and plan space with a suitable example. **[8]**

SECTION - II

Q5) a) Define Plan. Explain a partial-order plan that is a solution to the shoes-and-socks problem. **[8]**

b) Explain partially instantiated operators, Knowledge engineering for planning with a suitable example. **[8]**

Q6) a) Describe following Practical planners. **[8]**

i) Spacecraft assembly

ii) Job shop scheduling

b) Describe Analysis of hierarchical decomposition. **[8]**

Q7) a) Explain a conditional planning with a suitable example. **[8]**

b) Explain simple replanning with execution monitoring. **[8]**

Q8) a) What are the axioms of probability? Three horses A, B and C are in a race; A is twice as likely to win as 3 and B is twice as likely to win as C. What are their respective probabilities of winning, i.e. P(A),P(B) and P(C)? **[10]**

b) Explain decision networks? How an agent enables to choose information to acquire? **[8]**

Total No. of Questions : 8]

SEAT No. :

P2865

[Total No. of Pages :2

[4660] - 422
M.E. (Computer) (Semester - I)
INTERNET ROUTING DESIGN
(2008 Pattern) (Elective - I(c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain IPV4 header structure. Which of the fields in IPV4 header are changed by a router? **[8]**

b) What is network algorithmics? Explain in detial. **[8]**

Q2) a) Explain router architecture with respect to functional view in detail. **[8]**

b) Explain Bellman - ford centralized algorithm in detail. **[8]**

Q3) a) Explain split horizon and split horizon with poisoned reverse. **[8]**

b) Explain subprotocols of link state protocol. **[8]**

Q4) a) Draw and explain packet format of RIPV1. Explain the differences between RIPV1 and RIPV2. **[9]**

b) Compare IS-IS and OSPF. Router classification in OSPF. Explain in detail. **[9]**

P.T.O.

SECTION - II

Q5) a) Explain BGP timers in detail. **[8]**

b) Explain basic and complex forwarding functions of a router. **[8]**

Q6) a) Explain longest prefix matching problem. What are the requirements of longest prefix matching? **[8]**

b) Explain fixed stride multibit trie with suitable example. **[8]**

Q7) a) Explain binary search on prefix lengths method with suitable example. **[8]**

b) What is packet classification? Explain Grid-of-tries method with suitable example. **[8]**

Q8) a) What is QOS? Explain the algorithm for QOS minimum delay path with bandwidth feasibility. **[9]**

b) Explain traffic Engineering for voice over MPLS. **[9]**

Total No. of Questions : 8]

SEAT No. :

P2866

[Total No. of Pages : 2

[4660] - 423
M.E. (Computer Engineering) (Semester - I)
MOBILE COMPUTING (Elective - I)
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Draw schematic diagram of the GSM network and show the location of following components in it. **[16]**

a) MSC/VLR
b) HLR
c) AUC
d) EIR
e) GMSC
f) BSC
g) BTS
h) MS
i) OSS

Q2) a) List the major parameters need to consider for calculating performance of cellular Networks & explain them in brief. **[8]**

b) Explain the different frequencies used between MS, BTS, BSC, MSC and Gateway MSC in cellular network. **[8]**

Q3) a) Explain GSM with FDMA and TDMA in brief. **[8]**

b) Explain SCCP protocol with its message format. **[8]**

P.T.O.

Q4) a) Describe CDMA system capacity using amount of user interference in the band. **[8]**

b) Write a short note on Abis - Interface between BTS and BSC. **[10]**

SECTION - II

Q5) Discuss Air - Interface of GSM with following features. **[18]**

a) Structure of Air - Interface FDMA/TDMA scheme.

b) Frame Hierarchy and frame numbers.

c) Synchronization between Uplink and Downlink.

Q6) a) List all the signaling channels of GSM Air - Interface and explain mapping of logical channels onto physical channels in brief. **[8]**

b) Explain with neat diagrams message types in SS7 (any two) : **[8]**

i) Fill-In Signal Unit

ii) Link status Signal Unit

iii) Message Signal Unit

Q7) a) Write a short note on mobile security with consideration of following: **[8]**

i) Mobile application security.

ii) Mobile operating system security.

b) Discuss in brief SIM with its desired characteristics. **[8]**

Q8) a) Write a short note on TCAP messages used in GSM with neat diagrams of message frames. **[8]**

b) Explain NSS with consideration of MSC, HLR, VLR and EIR in brief. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2867

[Total No. of Pages : 2

[4660] - 424

M.E. (Computer Engineering) (Semester - I)

INFORMATION AND NETWORK SECURITY

(2008 Pattern) (Elective - II (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Enlist and explain steps necessary for creating information security policy. **[7]**

b) Explain how different security mechanisms are related to security services? **[7]**

c) Briefly explain service interruption-based attack. **[4]**

Q2) a) Explain the encryption and decryption operation in the Data Encryption Standard (DES) with suitable example. **[8]**

b) What requirements must a public key cryptosystems fulfil to be a secure algorithm? **[8]**

Q3) a) What is meant by bastion host? Describe the screened-subnet firewall system with a Demilitarized Zone (DMZ). **[8]**

b) What are the basic protections provided by secure socket layer? How can it found Whether the user has entered into a secure site? **[8]**

P.T.O.

Q4) Write Short Notes on (Any Three) : **[16]**

a) Physical and logical access control.

b) Issues in multi-level secure systems.

c) ARP hazard.

d) Denial of service.

SECTION - II

Q5) a) Explain what is key localization in SNMP. **[7]**

b) Explain in brief approaches for solving discrete logarithm problem. **[7]**

c) Explain in brief, what is route aggregation. **[4]**

Q6) a) Explain how firewall differs from intrusion detection system? List the issues to be addressed when installing firewall. **[8]**

b) Explain the difference between a packet-filtering router and a stateful inspection firewall? **[8]**

Q7) a) Explain how wireless security is different from wired data security, and how WEP addresses security in wireless LANs. **[8]**

b) Explain security of the Diffie-Hellman algorithm. Discuss advantages and limitations of the Diffie-Hellman algorithm. **[8]**

Q8) Write Short Notes on (Any Three) : **[16]**

a) Consensus and agreement protocols.

b) Source masking and hidden channels.

c) One time passwords.

d) Secure RSVP.

● ● ●

Total No. of Questions : 12]

SEAT No. :

P2868

[Total No. of Pages : 3

[4660] - 425
M.E. (Computer) (Computer Engg.)
ADVANCED COMPILERS
(2008 Pattern) (Elective - II (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain Top down and Bottom Up Parsing in detail with the help of suitable example grammars. **[10]**

b) What is "Semantic analysis" phase of compiler? Explain in detail. **[6]**

OR

Q2) a) Explain the phases of compilation in detail along-with suitable example. How the errors checking and recovery is handled by every phase. **[8]**

b) Describe how the LEX and YACC utilities are used as automatic generators. Make use of suitable examples **[8]**

Q3) a) Explain various register allocation techniques with example. **[8]**

b) Explain "Peephole optimization" in detail with suitable example. **[8]**

OR

Q4) a) Explain the concept of "Code generator generator". **[8]**

b) Explain the phase "code generation" for pipeline machines. **[8]**

P.T.O.

Q5) a) What is Static Single Assignment form. Explain how it is used during optimization phase of compilation. **[10]**

b) Explain Machine dependent and machine independent code optimization in detail with suitable examples. **[8]**

OR

Q6) a) Explain the unified algorithm for data flow analysis. **[8]**

b) Explain in detail the theory of data flow analysis. **[10]**

SECTION - II

Q7) a) Explain the Structure of a Parallel compiler. **[8]**

b) Give example of Parallel Compiler and explain how Parallelism detection is done with data dependence, direction vectors. **[8]**

OR

Q8) a) Explain loop carried and loop independent dependencies during parallel compilation. **[8]**

b) What is a motivation for designing Parallel Compilers. Give the Overview of Parallel Compilers. **[8]**

Q9) Explain the following with respect to Distributed Compilation: **[16]**

a) Data partitioning

b) Instruction scheduling

c) Register allocation

OR

Q10)Explain the following with respect to Distributed Compilation: **[16]**

a) Machine optimization

b) Dynamic compilation

Q11) Write short note on: **[18]**

a) Latest Distributed Compilers in use today

b) Latest Parallel Compilers in use today

c) Role of Automatic generators in designing "Advanced Compilers"

OR

Q12) Write short note on: **[18]**

a) Just in Time Compilers

b) Auto scheduling Compilers

c) iBURG Tool

Total No. of Questions : 12]

SEAT No. :

P2869

[Total No. of Pages : 3

[4660] - 426
M.E. (Computer Engg.) (Semester - I)
Web Services and SOA (Elective - II (c))
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are Web services? List out various advantages of Web Services Technology. **[6]**

b) Write Short Notes on : **[12]**

i) WSDL

ii) SOAP

iii) UDDI

OR

Q2) a) Compare SOA, to Client Server and Distributed Architecture. **[10]**

b) Explain the Web Services Security in detail. And List out the four web Services Security layer basic requirements. **[8]**

Q3) a) What is SOA explain in detail characteristics of SOA. **[8]**

b) Explain in detail Service Oriented Architecture and List the key functional components of SOA. **[8]**

OR

P.T.O.

Q4) a) Discuss Step by Step Service modeling in detail and explain basic modeling building blocks. **[8]**

b) Write Short Notes on : **[8]**

i) Evolution of SOA.

ii) Enterprise Service Bus.

Q5) a) Explain in detail SOA Life Cycle. **[8]**

b) How the SOA lifecycle changes the role of the SOA architect as compared to traditional enterprise architect. **[8]**

OR

Q6) a) What differentiates the SOA lifecycle from the traditional application lifecycle? **[8]**

b) Write Short Notes on. **[8]**

i) Business centric SOA.

ii) Enterprise solution assets.

SECTION - II

Q7) a) Explain in detail Service-oriented design process. **[8]**

b) How does Web Services Management integrate with existing applications? **[6]**

c) What is the importance of the Web services standards? **[2]**

OR

Q8) a) Explain ESB architecture in detail. **[8]**

b) What is the difference between definition, enforcement and enablement? **[8]**

Q9) a) Write Short notes on. **[8]**

i) SLA considerations.

ii) Role of ESB in SOA governance.

b) What is Web services management? Explain the need of Web Service Management. **[8]**

OR

Q10)a) Explain in detail service level agreement (SLA) monitoring. **[8]**

b) Explain in detail SOA governance and it's any three major components. **[8]**

Q11)a) What Ajax is? List and explain in details various applications of Ajax. **[8]**

b) Write Short Notes on. **[10]**

i) RSS Feed

ii) RSS Reader

OR

Q12)a) What is Blog? Explain in detail various types of blogging. **[10]**

b) What is JavaScript? List and explain various applications of JavaScript in detail. **[8]**

Total No. of Questions : 12]

SEAT No. :

P2870

[Total No. of Pages : 3

[4660] - 427

M.E. (Computer) (Computer Engineering) (Semester - I)

EMBEDDED SYSTEMS DESIGN

(2008 Pattern) (Elective - II (d))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***

SECTION-I

Q1) a) Explain the various characteristics of embedded system? **[8]**

b) Explain the use of RAM and EPROM in embedded systems design. **[8]**

OR

Q2) a) What are the design metrics for embedded systems? Explain. **[8]**

b) What are the components of embedded system hardware? Explain with neat diagram. **[8]**

Q3) a) Enlist the differences between ARM7 and ARM9. **[8]**

b) How high performance computing is supported by IBM Power PC Processor? Explain. **[8]**

OR

Q4) a) Give the features of Intel Xsclale Processor used to support high performance computing. **[8]**

b) Explain the features of ARM9 is suitable with suitable example. **[8]**

P.T.O.

Q5) a) Explain data transfer mechanism in l2C protocol. Compare with CAN protocol based on bit rate and application area. **[12]**

b) Explain the USB used for communication. **[6]**

OR

Q6) a) Explain the components required to make IrDA communication between two devices. Also give the data rate for different range of coverage. **[6]**

b) Explain the handshaking signals used in serial communication and parallel communication with the help of application block diagram. **[12]**

SECTION - II

Q7) a) What are ASICs? Explain in detail the architectural features. **[8]**

b) What is the use of FPGA in embedded systems design? Explain with example. **[8]**

OR

Q8) a) Explain the programming of FPGA and CPLD. **[8]**

b) What are the different types of ASICs. How they differ in architecture? **[8]**

Q9) a) What are the services of OS ? What are the functions of I/O subsystem? **[9]**

b) Explain the real time features of Vx works. **[9]**

OR

Q10)a) How RTOS manages the interrupts? **[10]**

b) Give the different features of RT Linux. **[8]**

Q11)a) Which features of Java language are useful in embedded system programming also mention its disadvantages. **[8]**

b) What are the application of Queues and Stacks in embedded system design ? Explain with example. **[8]**

OR

Q12)a) Give the steps in the Embedded Software Development Process. **[8]**

b) What are the advantages and disadvantages of C++ language for embedded system programming. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2871

[Total No. of Pages : 2

[4660] - 428

M.E. (Computer Engineering) (Semester - II)

DISTRIBUTED SYSTEMS

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Why is scalability an important feature in the design of a distributed system? Discuss some of the guiding principles for designing a scalable distributed system. **[6]**

b) What is an open distributed system and what benefits does openness provide? **[6]**

c) Explain what is meant by transparency and give examples of different types of transparency in distributed systems. **[4]**

Q2) a) List out issues and difficulties related to design and implementation of middleware for peer-to-peer System. Suggest solutions to overcome such issues. **[8]**

b) Explain Ricart and Agrawala's algorithm for mutual exclusion. Can Ricart and Agrawala's algorithm lead to deadlocks? Justify. **[8]**

Q3) a) Describe blocking and non-blocking types of IPC. Which is easier to implement and why? Discuss their relative merits and demerits. **[8]**

b) Explain how NTP distribute time information over the internet. **[8]**

Q4) Write notes on any THREE : **[18]**

a) Distributed transactions

b) Maekawa's voting algorithm

c) Events and notifications

d) Automounter in NFS

P.T.O.

SECTION - II

Q5) a) What is key distribution problem? How does it differ for symmetric and asymmetric cryptosystems? **[8]**

b) How Diffie-Hellman based Key Agreement protocol is beneficial for providing security in group communication issues? How can this protocol be used for secured cash transfer in banking transactions? **[8]**

Q6) a) Explain RPC mechanism in detail with the help of diagram. **[6]**

b) What is false sharing? When it is likely to occur? Can this problem lead to any other problem in a DSM system? Explain with reason. **[6]**

c) What are the three main approaches for designing a DSM system? **[4]**

Q7) a) A coordination protocol could be carried out in order to coordinate the actions of web services. Outline the architecture for a centralized and distributed coordination protocol. In each case, describe the interactions needed to establish coordination between a pair of web services. **[8]**

b) Explain why UDDI can be described as being both a name service and a directory service. **[8]**

Q8) Explain any THREE with suitable example : **[18]**

a) Digital signatures

b) SOAP Architecture

c) X.500 directory service

d) Inter-process communication in UNIX

Total No. of Questions : 8]

SEAT No. :

P2872

[Total No. of Pages : 2

[4660] - 429

M.E.(Computer Engineering / Computer Networks)

HIGH PERFORMANCE DATABASE SYSTEM

(2008 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Explain TP - Monitor architecture & Its components with neat diagram. **[5]**

b) Explain how to use a histogram to estimate the size of a selection of the form $6_{ACV}(r)$. **[5]**

c) How does a TP Monitor manage processes, messaging & communications. **[6]**

Q2) a) Draw a wait for graph indicating a deadlock. Explain three actions that need to be taken for recovery from dead lock. Also explain any one method for dealing with deadlock in a distributed system. **[8]**

b) How is relational algebra useful in query optimization? List down at least four equivalence rules used in query optimization. **[8]**

Q3) a) Explain shadow paging recovery scheme & log based scheme. **[8]**

b) What are the advantages & disadvantages of hash indices relative to B^+ tree indices? How might the type of index available influence the choice of a query processing strategy? **[8]**

P.T.O.

Q4) a) State & Explain OLAP operations. **[6]**

b) Explain the most common steps of ETL process. **[8]**

c) List the primitives for specifying a data mining task & describe any one. **[4]**

SECTION - II

Q5) a) Explain classification process in detail with example. **[8]**

b) Discuss various SQL extensions in detail. **[8]**

Q6) a) Explain active and deductive databases.Explain its merits & demerits. **[8]**

b) What is the difference between. **[8]**

i) XML element & an attribute.

ii) DTD & a XML schema.

Q7) a) Discuss the main memory database access methods. **[8]**

b) Describe how LDAP can be used to provide multiple hierarchical views of data, without replicating the base level data. **[8]**

Q8) Write short notes (any three) **[18]**

a) Decision Tree.

b) Deductive databases.

c) BI & Dashboards.

d) Star Schema.

Total No. of Questions :8]

SEAT No. :

P2749

[Total No. of Pages :3

[4660]-43

M.E. (Civil) (Hydraulics)

SYSTEMS TECHNIQUES IN WATER RESOURCES ENGINEERING

(2008 Pattern) (Elective - I) (Semester - I) (501304)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Explain the concept of system and its characteristics with the help of an example from water resources engineering. **[8]**

b) What are the classical and advanced techniques that can be adopted to analyse the water resources engineering problems? **[8]**

Q2) a) What are the various forms of linear programming model? State the equation and explain the terms. **[4]**

b) Maximize $f = 5x + 2y$ subject to $3x + 4y \leq 24;\ x - y \leq 3;\ x + 4y \leq 4;\ 3x + y \geq 3;$ $x \geq 0;\ y \geq 0$ using simplex method. **[12]**

Q3) a) Explain 'method of Lagrange multipliers' and compare it with 'method of direct substitution'. **[6]**

b) Find the value of 'x' in the interval (0, 1) which minimizes the function $f = x^3 - 10x - 2x^2 + 10$ to with in ± 0.05 by Fibonacci method. **[12]**

Q4) a) Compare linear and dynamic programming approaches. **[4]**

b) Discuss with the help of an example in water resources engineering, stepwise procedure of dynamic programming approach. **[12]**

P.T.O.

SECTION -II

Q5) a) For what value of 'λ' the game with following payoff matrix is strictly determinable? **[4]**

		Player B		
		B_1	B_2	B_3
Player A	A_1	λ	6	2
	A_2	-1	λ	-7
	A_3	-2	4	λ

b) Write dual geometric program (DGP) for the following GP. **[4]**

Minimize $f(t) = \frac{1}{t_1 t_2 t_3} + 2t_2 t_3 + 3t_1 t_3 + 4t_1 t_2$ Subject to $t_1, t_2, t_3 > 0$.

c) If customers are arriving at a cafeteria at an average rate of 0.3 per minute and they are being served at an average rate of 0.5 per minute, then find **[4]**

i) Average number of customers being served.

ii) The average number of customers waiting to be served at any given time.

d) Discuss 'Benefit - Cost Ratio Method' ; a discounting technique. What are the broad indicators of direct & indirect benefits for an irrigation project. **[6]**

Q6) a) A hydro power project costs 32.4 million Rs. and is expected to generate cash flows of 16 million Rs., 14 million Rs. and 12 million Rs. over its life of first three years. Calculate internal rate of return. **[8]**

b) There are seven tenders to be evaluated, each of which has to go through two scrutiny officers X & Y in order XY. Processing time in hours is given as **[8]**

Tender No.	1	2	3	4	5	6	7
Mr. X. evaluator:	3	12	15	6	10	11	9
Mr. Y. evaluator:	8	10	10	6	12	1	3

Determine a sequence of these tenders to be evaluated, that will minimize the total elapsed time 'T'. Also find the idle time for Mr. X and Mr. Y.

Q7) a) Discuss applications of Game Theory? What are the characteristics of games? What are the factors classifying games? Differentiate between pure strategy and mixed strategy. **[8]**

b) Explain Kendall's Notations for queuing models. Discuss queue discipline 'FCFS' ; 'FIFO' ; 'LCFS' , 'RSS'. What is (M/M/1) : (N/ FCFS) model. **[8]**

Q8) Write short notes: **[16]**

a) PV of an Annuity, Perpetual Annuity, Deferred Annuity,

b) Simulation : Process & Application

c) Unconstrained and constrained problems

d) Graphical method for Game Theory.

EEE

Total No. of Questions : 8]

SEAT No. :

P2873

[Total No. of Pages : 2

[4660] - 430

M.E. (Computer Engineering) (Semester - II)

NETWORK DESIGN MODELING AND ANALYSIS

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Describe exponential random variable and what is memory less property of random variable? **[7]**

b) Discuss in details the probability of failure in establishing a connection in a network. **[7]**

c) Explain relation between CDF and pdf with suitable diagram. **[4]**

Q2) a) Messages arrive independently to a system at the rate of 1 message in 5 seconds. The lengths of messages are exponentially distributed with an average 2400 characters. The channel used for transmission has rate of 9600 bps, character is represented by ASCII format. Find, **[8]**

i) Average service time

ii) Arrival rate

iii) Service rate

iv) Utilization of server

v) Average number of messages

b) Explain delay in communication subnet and describe components of delay. **[8]**

P.T.O.

Q3) a) Explain and analyze in detail "queuing system with infinite servers". Give its applications. **[8]**

b) Analyze M/M/2 queuing system using state transition diagram. **[8]**

Q4) Write short notes on (Any three) **[16]**

a) Little's Theorem

b) Multiplexing of Traffic on a communication Link.

c) Networks of Queues

d) Bernoulli random variable

SECTION - II

Q5) a) Explain CMST Algorithm with the help of suitable example. **[8]**

b) Explain in detail ADO algorithm for terminal concentrator location? **[8]**

Q6) a) Explain in detail performance analysis of Data Link Layer? **[8]**

b) Explain M/M/m Queue with state transition diagram? **[8]**

Q7) a) What is sub-netting and super-netting? Explain with suitable examples. **[8]**

b) Enlist and explain different functions and responsibilities with respect to Network Administration. **[8]**

Q8) Write short notes on (Any three) **[18]**

a) Security management tools

b) Esau-William's algorithm

c) Terminal assignment

d) Security Audit

Total No. of Questions : 8]

SEAT No. :

P2874

[Total No. of Pages : 3

[4660] - 431

M.E. (Computer)

SOFTWARE DESIGN AND ARCHITECTURE (Elective - III(a))

(2008 Pattern) (Theory)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) Explain ANY FOUR with examples **[16]**

a) Software design constraints

b) Incremental development

c) Use of UML for design representation

d) Software design process

e) Design quality: modifiability, re-usability

f) Concepts: event based systems, call and return

Q2) a) Explain what you understand by coupling cohesion **[4]**

b) Explain proxy pattern and its working **[4]**

c) Write on pipes and filters architectural style **[4]**

d) What do you understand by object hierarchy/class inheritance **[4]**

P.T.O.

Q3) a) What are components. What are the advantages of using components for composing applications. **[4]**

b) Write about client sever systems and give an application example **[4]**

c) Discuss about reliability, performance of web based systems **[4]**

d) What are advantages of JAVA technology to develop systems **[4]**

Q4) Explain in brief with an example diagram on ANY SIX **[18]**

a) Jackson structure diagram

b) Waterfall model versus spiral model

c) ER models, DFDs

d) Top down decomposition and modules

e) Archetype patterns: product

f) Publish subscribe pattern

g) High level design, detailed design, physical design

h) User interface design, data design

SECTION - II

Q5) Write in brief on **16]**

a) What do you understand by components and connectors

b) Three tier client server systems

c) The three types of relationships between modules: isa, depends on(uses) and is a part of relationship

d) Documenting behaviour using sequence and use-case diagrams

Q6) Imagine that you have to design a hypothetical website for IPL cricket matches. For this website discuss. **[16]**

a) what requirements/features could you have for your site(Hint: live scores,high speed videos..)

b) How will you make the website usable/user friendly

c) What performance, security features will you expect

d) How will you use client server architectural style for your website

Q7) Illustrate the following concepts with examples of your own **[16]**

a) Provided and required interfaces

b) Documenting interfaces completely

c) CRM archetype

d) Code view,configuration management, software builds

Q8) Write Short Notes on ANY THREE **[18]**

a) Design patterns

b) Object oriented concepts and object oriented design

c) Allocation view and deployment diagram

d) Software design

e) Archetype patterns

f) Role of design and architecture in software development life cycle

Total No. of Questions : 8]

SEAT No. :

P2875

[Total No. of Pages : 2

[4660] - 432

M.E. (Computer Engineering) (Semester - II)

PATTERN RECOGNITION AND MACHINE VISION

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

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) What is the need of Pattern recognition? State and explain the applications of pattern Recognition. **[8]**

b) State and Explain the basic stages involved in the design of a classification system. **[8]**

Q2) a) Explain the nearest neighbor approach for multi-category classification. **[8]**

b) Explain Bayes minimum error rate pattern classifier with the help of an example. **[8]**

Q3) a) Discuss the use of PCA (Principle Component Analysis) for image formation. **[8]**

b) Define within-class scatter matrix & between-class scatter matrix. Discuss the discriminant analysis for 2-class problem. **[8]**

Q4) Write a short notes on any three **[18]**

a) Active shape models

b) Unbiased modeling and prediction

c) Linear discriminant analysis

d) Levenberg-Marquardt algorithm

P.T.O.

SECTION - II

Q5) a) Explain the segmentation of flexible shapes by clustering of pixels & intensity. **[8]**

b) Discuss the main properties of the essential and fundamental matrices? Discuss eight point algorithm. **[8]**

Q6) a) Discuss the hierarchical approach for the motion analysis **[8]**

b) What is stereo data fusion? How it can be used in reconstruction of stereo vision? **[8]**

Q7) a) Explain the correlation method for stereo matching, in detail. **[8]**

b) Explain Object recognition using geometrics hashing. **[8]**

Q8) Write a note on any three **[18]**

a) Surface triangulation

b) Graph matching and interpretation tree

c) Eigenspace multi-view methods

d) Linear Kalman filters

Total No. of Questions : 8]

SEAT No. :

P2876

[Total No. of Pages : 2

[4660] - 433

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

NETWORK PROGRAMMING

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Explain TCP state transition diagram in detail with connection establishment and termination. **[8]**

b) Explain with neat diagram interconnection between various protocols in TCP/IP protocol suite. **[8]**

Q2) a) Explain Byte ordering and Byte manipulation functions in detail with example. **[8]**

b) Explain socket address structure of IP V4. Explain the use with suitable program. **[8]**

Q3) a) Explain routing socket in detail. **[8]**

b) Write a program for UDP client - server. Explain in detail. **[8]**

Q4) Write a short note on (any three) : **[18]**

a) Significance of port numbers in computer network.

b) Buffer size and IP datagram.

c) Resource records in DNS.

d) Crashing and Rebooting of server host.

P.T.O.

SECTION - II

Q5) a) Explain in detail IPV6 server on dual stack host serving both IPV4 and IPV6 clients. **[8]**

b) Explain with suitable example different forms of addressing in computer network. List the protocols which use these addresses. **[8]**

Q6) a) Explain Network Time protocol in detail with example. **[8]**

b) Explain multicasting on wide area network. **[8]**

Q7) a) Explain multicast and broadcast addresses in detail with suitable example. **[8]**

b) Explain basic thread functions. **[8]**

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

a) IPV6 multicast address.

b) TCP prethreaded server.

c) IPV6 address testing macros.

d) Race conditions and shared data access.

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Total No. of Questions : 8]

SEAT No. :

P2877

[Total No. of Pages : 2

[4660] - 434

M.E. (Computer Engineering) (Semester - I)

ADVANCED INTERNET PROGRAMMING

(2008 Pattern) (Elective - III (d))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain the evolution of markup languages that helped us to see the Web as it is today. **[8]**

b) Enlist and explain TCP/IP networking model layers. **[8]**

Q2) Explain in detail the MVC design pattern implemented for J2EE framework. **[16]**

Q3) a) List out the control statements in JavaScript. Demonstrate use of any one control statement with an example. **[6]**

b) Explain Advantages and disadvantages of an Applet. **[4]**

c) Explain with the help of suitable code template, how to create interactive pages in Java Script using “prompt” and “form”. **[8]**

Q4) Write Short notes on **[16]**

a) J2EE specification

b) FTP

c) Enterprise Java Beans

d) WWW

P.T.O.

SECTION - II

Q5) a) Write a suitable code skeleton to demonstrate the use of a simple servlet which calculate the multiplication of two numbers. **[10]**

b) Explain how JDBC is used to connect a java application to database. **[6]**

Q6) a) With the help of suitable code template, explain how JSP allows separation of presentation logic from business logic. **[8]**

b) Write a sample code to demonstrate use if PHP in HTML. **[8]**

Q7) a) What is PHP? Explain the use of PHP in **[8]**

i) Server side scripting

ii) Command line scripting

iii) Creating desktop application

b) Give an overview of IBM Portlet API. **[4]**

c) Briefly explain following core JNDI packages **[6]**

i) javax.naming

ii) javax.naming.directory

iii) javax.naming.event

iv) j avax.naming. 1dap

Q8) Write short notes on **[16]**

a) Internationalization and localization

b) JMS

c) Java Mail API

d) C#

Total No. of Questions : 8]

SEAT No. :

P2878

[Total No. of Pages : 2

[4660] - 435

M.E. (Computer Engineering) (Semester - II)

A : SOFTWARE PROJECT MANAGEMENT

(2008 Pattern) (Elective - IV)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) What is Software Project Management? Explain the phases of Software project management. **[8]**

b) Explain the challenges in Software project management. **[8]**

Q2) a) Give the best practices in Software Project Planning. **[8]**

b) What are the types of risks? How do you identify them? How the Risk table is used in Risk analysis? **[8]**

Q3) a) What is the purpose of project review? Explain the review process. **[8]**

b) Explain the cost benefit analysis. **[8]**

Q4) Explain the following.(Any three) **[18]**

a) Stakeholders in Project Management

b) Process model

c) Tracking schedule

d) Critical path

P.T.O.

SECTION - II

Q5) a) Explain the quality factors. **[8]**

b) Give the team organizations in project management. **[8]**

Q6) a) Explain the function point analysis for estimation. **[8]**

b) Explain the size oriented metric and how they are used in estimation? **[8]**

Q7) a) How do you manage complex project? **[8]**

b) Explain the Risk management. **[8]**

Q8) Explain the following. (Any three) **[18]**

a) Measurement and metric

b) Status report

c) Timeline chart

d) Project feasibility

Total No. of Questions : 8]

SEAT No. :

P2879

[Total No. of Pages : 2

[4660] - 436

M.E. (Computer Engineering) (Semester - II)

INFRASTRUCTURE MANAGEMENT

(2008 Pattern) (Elective - IV)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Explain the value of system management for business. **[8]**

b) What is meant by infrastructure management? What are the benefits of infrastructure management? **[8]**

Q2) a) State why organizations implement ITIL best practices. What are the benefits of these practices? **[8]**

b) Explain in brief system context diagrams. **[8]**

Q3) Describe in detail the following process steps of change management and factors critical to its success: **[16]**

a) Procedure for handling changes

b) Role and responsibilities of the IT support staff

c) Measurements for change management

Q4) With reference to infrastructure, give example of clear risk. State why risk management is essential in this case. When risk management is considered cost effective? How is risk identification carried out? What is risk prioritization? What are impact categories? What is risk management planning? Give examples of top 10 risks and mitigation steps? **[18]**

P.T.O.

SECTION - II

Q5) a) Discuss the issues involved in IT services continuity management in detail. **[8]**

b) How can we achieve insight into the value creation process with the aid of financial management? **[8]**

Q6) a) What are necessary arrangements needed for data and application storage and their recovery in case of failures. **[8]**

b) Explain various network security services, which an organization must deploy as an infrastructure. **[8]**

Q7) a) Explain the steps in incident management process. **[8]**

b) Enlist and explain challenges, critical success factors and risk in release process. **[8]**

Q8) Explain any THREE with suitable example : **[18]**

a) Access Management.

b) Activities of service level management.

c) Space Management.

d) Identity Management.

Total No. of Questions : 10]

SEAT No. :

P2880

[Total No. of Pages : 3

[4660]-437
M.E. (Computer Engineering)
C : DATA WAREHOUSING AND DATA MINING
(2008 Pattern) (Elective - IV)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Explain nine steps design methodology for Data Warehouse. **[8]**

b) Explain Multidimensional Model with suitable example. **[8]**

Q2) a) Explain different methods for handling Data Redundancy in Data Integration. **[9]**

b) Assume that we apply square root transformation to a ratio attribute x to obtain the new attribute x*. As part of your analysis, you identify an interval (a,b) in which x* has a linear relationship to another attribute y. **[8]**

i) What is the corresponding interval (a,b) in terms of x?

ii) Give equation that releases y to x.

Q3) a) Explain different data reduction strategies for Numerosity reduction. **[9]**

b) Explain different Data Mining Primitives. **[8]**

P.T.O.

Q4) a) Explain the following Terms with suitable example : **[10]**

i) Frequent Patterns.

ii) Closed Patterns.

iii) Max. Patterns.

iv) Support.

v) Confidence.

b) Explain Frequent Pattern Growth mining method with suitable example. **[7]**

Q5) Write a short Note on : **[17]**

a) Meta Data.

b) Load Manager in Data Warehouse.

c) Data Decartelization.

SECTION - II

Q6) a) Describe K-Nearest Neighbor classifiers with suitable example. **[8]**

b) Explain different attribute splitting criteria with suitable example in decision tree technique. **[8]**

Q7) a) Explain different distance measures in Clustering mining task. **[9]**

b) Explain bagging and Boosting methods for multiple classification model. **[8]**

Q8) a) Describe Density reachable and density connected parameters in density based clustering method with suitable example. **[9]**

b) Explain Keyword-based Association and Document Classification in Text Mining. **[8]**

Q9) a) Many partitional clustering algorithms that automatically determine the number of clusters claim that this is an advantage. List two situations in which this is not the case. **[9]**

b) Define Information Retrieval System. Describe Vector Space Model. **[8]**

Q10) Write a short Note on : **[17]**

a) Spatial Association.

b) Outlier Analysis.

c) Web Mining.

Total No. of Questions : 8]

SEAT No. :

P2881

[Total No. of Pages : 2

[4660]-442
M.E. (CE) (Computer Networks) (Semester - I)
INTERNET ROUTING DESIGN
(2008 Pattern) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) What are the fundamental problems faced by Internet Routers? Explain the cause by scale & Services in details. **[8]**

b) Consider an IPv4 packets going through a router **[10]**

i) Determine which fields in the header are minimally changed before the packet is forwarded.

ii) Which fields are also possibly changed at a router?

Q2) a) Explain Split Horizon technique. **[8]**

b) Compare following : **[8]**

i) Bellman - Ford algorithm & Distance Vector algorithm.

ii) Shortest path routing & the widest path routing.

Q3) a) Write short note on Link State Protocol. **[4]**

b) Write short note on BGP message format. **[4]**

c) Consider a five - router OSPF network. How many entries will be in the routing table at each router? Which are those entries? **[8]**

P.T.O.

Q4) a) What is relation between AS & ISP? What is similarities and differences between IS-IS and OSPF. **[8]**

b) Identify issues faced in a distance Vector routing protocol & suggest the suitable solution to overcome these issues. **[8]**

SECTION - II

Q5) a) Discuss the strengths & weaknesses of various router architectures. **[8]**

b) What lookup algorithms can be used for ARP caches? Explain the algorithm with suitable illustration. **[8]**

Q6) a) Explain different routing protocols for QoS routing. **[8]**

b) What are the different types of matches allowed in packet classification rules? Explain any one packet classification algorithm. **[8]**

Q7) a) Explain any four close loop flow control strategies. **[8]**

b) Compare different 2-dimensional packet Classification Algorithms on the basis of Time & Space Complexity. **[8]**

Q8) a) Write short notes on any two : **[10]**

i) Hardware algorithms of lookups

ii) Multibit tries

iii) ATM PNNI

b) Write a note on layer 2 VPN Traffic engineering. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2882

[Total No. of Pages : 2

[4660]-443
M.E. Computer (Computer Networks) (Semester - I)
ADVANCED TCP / IP
(2008 Pattern) (Elective - I (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Explain with examples how to obtain information about hosts, Networks, protocols, and network services in a client server environment. **[8]**

b) An ISP is granted a block of addresses starting with 120.60.4.0 / 20. The ISP wants to distribute these blocks to 100 organizations with each organization receiving 8 addresses only. Design the sub blocks and give the slash notation for each sub blocks. Find out how many addresses are still available after these allocations? **[8]**

Q2) a) Explain address acquisition states of DHCP. Explain lease renewal states with message types in DHCP operation. **[8]**

b) Explain two-step bootstrap procedure in BOOT P. **[8]**

Q3) a) Draw and compare DNS Structure with the Unix directory structure. **[8]**

b) A DNS client is looking for the name of a computer with IP address 132.1.17.8 Show the query and response message. **[8]**

P.T.O.

Q4) Write short notes on (Any Three) : **[18]**

a) RARP Servers.

b) DNS resolution.

c) Complexity of servers.

d) Network Virtual Terminal.

SECTION - II

Q5) a) Show the sequence of bits sent from a client TELNET for binary transmission of 11110011 00111100 11111111? What is minimum number of bits at TCP level? **[8]**

b) Explain the modes of operation of Telnet? Explain with diagram the use of SUPRESS, GO AHEAD and ECHO options? **[8]**

Q6) a) Show FTP commands and response for retrieving a list of items in a directory. **[8]**

b) Explain TFTP error control mechanism. What is Sorcerer's apprentice bug? **[8]**

Q7) a) In SMTP, if we send a one line text between two users how many lines of commands and response are exchanged? Which are they? **[8]**

b) Show the request that retrieves the document / usr / users / doc / doc /. Use at least two general headers, two request headers & one entity header. Also Show response header for successful request. **[8]**

Q8) Write Short Note on **any three** : **[18]**

a) Persistent and Non persistent connection in HTTP.

b) QoS in RTP.

c) TFTP.

d) HTTPS.

Total No. of Questions : 8]

SEAT No. :

P3463

[Total No. of Pages : 2

[4660] - 444

M.E. Computer (Computer Networks)

WIRELESS TECHNOLOGY

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are different propagations models? Explain the long term and short term fading of each. **[12]**

b) What is Spread spectrum? Explain DSSS & FHSS? **[6]**

Q2) a) Derive an expression for antenna efficiency in terms of radiation resistance. **[8]**

b) Discuss the protocol architecture of Bluetooth. **[8]**

Q3) a) Differentiate between distributed access protocols and centralized access protocols at MAC layer **[10]**

b) Explain Various Factors determining antenna Gain. **[6]**

Q4) Write Short Notes on (ANY THREE) : **[16]**

a) Channel Capacity

b) Line-of-Sight Transmission

c) Hard Hand-off Algorithm

d) Piconets & Scatternet

P.T.O.

SECTION - II

Q5) a) Discuss three error correction schemes that are used in Bluetooth. **[8]**

b) What is mobile IP? Explain about the operation of mobile IP. **[8]**

Q6) a) Draw & explain typical 802.11 MAC frames showing various fields. State what is the significance of type, subtype fields? **[8]**

b) Mentioned various multiple access technologies that are used in various wireless communication systems. **[8]**

Q7) a) Explain how TCP snooping can improve the TCP performance. **[8]**

b) Discuss the tunneling in Mobile IP. **[8]**

Q8) Write short notes on (ANY THREE) : **[18]**

a) Wireless Transmission

b) Working of EAP

c) WLL Technologies

d) M-TCP

Total No. of Questions : 8]

SEAT No. :

P2883

[Total No. of Pages : 2

[4660]-445
M.E. (Computer Networking) (Semester - II)
INFORMATION SECURITY AUDIT AND MANAGEMENT
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Describe the steps for resolving operational problems of managers in the course of organization's day to day operations. **[8]**

b) What is Project Management Body of Knowledge (PMBoK)? Why information security project manager follow methodologies based on PMBoK? **[8]**

Q2) a) According to the corporate governance task force, how can an organization implement effective security governance? **[8]**

b) Demonstrate sample Disaster Recovery plan adopted from Texas State Library. **[8]**

Q3) a) List and describe four elements that should present in Enterprise Information Security Policy (EISP). **[8]**

b) List and describe three approaches to policy development. In your opinion which is best suited by a smaller organization and why? If the target organization were very much larger, which approach would be superior and why? **[8]**

P.T.O.

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

a) Work break down structure (WBS).

b) Vulnerability assessment and remediation.

c) Crisis Management.

d) Approaches for creating and managing ISSP.

SECTION - II

Q5) a) State and explain different information security performance measures that must be implemented and integrated into ongoing information security management operation with example. **[8]**

b) List and describe the key areas of concerns for risk management. **[8]**

Q6) a) State and explain the following methods of establishing feasibility. **[8]**

b) How is an application layer firewall is different from packet filtering firewall? Why is an application firewall sometimes called as proxy server? **[8]**

Q7) a) What attributes do organizations seek in a candidate when hiring information security professionals? Priorities this list of attributes and justify your ranking. **[8]**

b) Describe foundations and frameworks of ethics. Explain series of ethical Standards. **[8]**

Q8) Write short notes on (Solve any three) : **[18]**

a) Information systems, audit and control associations (ISACA).

b) Security consideration for non-employees.

c) Microsoft's Risk Management Approach.

d) Privacy Law.

Total No. of Questions : 8]

SEAT No. :

P2884

[Total No. of Pages : 2

[4660]-446
M.E. (Computer) (Computer Network) (Semester - II)
OPERATING SYSTEM DESIGN
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) What is operating System? Explain functions of Operating system with examples. **[8]**

b) Explain System Call Mechanism using some Example. **[8]**

Q2) a) What are the different Scheduling Criteria? Explain different Uniprocessor Scheduling Algorithm with example. **[8]**

b) What is IPC? Explain Different IPC mechanisms and Blocking and Non-Blocking IPC Types. **[8]**

Q3) a) Explain Difference Between Process and Thread. **[8]**

b) What is Semaphore? Explain Different types of semaphore and explain producer-consumer problem using Semaphore. **[8]**

Q4) a) What is Context of a process? Explain Context Switch Process with diagram. **[8]**

b) What are the different types of group communication Explain following points related to one to many communication. **[10]**

i) Group Management

ii) Group Addressing

iii) Message Delivery to Receiver Process

P.T.O.

SECTION - II

Q5) a) What is Synchronization? What are classic problem of Synchronization? Explain Reder-Writer Problem with Solution. **[8]**

b) What is Deadlock? Explain necessary Condition for Deadlock. **[8]**

Q6) a) Write Short note on : **[10]**

i) Deadlock Avoidance

ii) Deadlock Detection and Recovery

iii) Resource Allocation Graph

b) Explain Bankers Algorithm with the help of Example. **[8]**

Q7) a) What are the different types of authentication used in multiprocessor system. Explain Following Mechanism for authentication: **[8]**

i) Proof By Possession

ii) Proof By Knowledge

iii) Proof By Property

b) Explain Different Services Provided by File System on Multiprocessor System. **[8]**

Q8) a) Explain Difference between : **[8]**

i) Active and Passive Attack

ii) Virus and Worms

b) What is Pipe? Explain Named and unnamed Pipe, Write any program using pipe. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2885

[Total No. of Pages : 2

[4660]-448
M.E. (Computer) (Computer Networking)
ADVANCED SOFTWARE ENGINEERING
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Differentiate between generic software product development and custom software development with example. **[8]**

b) Reliability and safety are related but distinct dependability attributes. Describe the most important distinction between these attributes and explain why it is possible for a reliable system to be unsafe and vice versa. **[8]**

Q2) a) With suitable example, explain how you will do object identification in the object-oriented design process. **[8]**

b) What is user interface prototyping? What are the different approaches that you can use for user interface prototyping? **[8]**

Q3) a) What is essential for forward error recovery to be implemented in a fault tolerant system? Is forward error recovery possible in interactive systems? **[6]**

b) Explain why a software system that is used in a real-world environment must change or become progressively less useful. **[6]**

c) What are the principal factors that affect the costs of system re-engineering? **[6]**

P.T.O.

Q4) a) Where you will use the algebraic techniques of formal specification? Explain Why? **[8]**

b) Explain the layered model of an architecture using suitable example. **[8]**

SECTION - II

Q5) a) With a suitable example show how to find cyclomatic complexity? **[8]**

b) Explain why a high-quality software process should lead to high-quality software products. Discuss possible problems with this system of quality management. **[8]**

Q6) a) What is throw-away prototyping? How it is different from incremental development approach? **[8]**

b) Explain the rapid application development environment. **[8]**

Q7) a) What are the advantages and disadvantages of using a goal-based rather than a practice-based maturity model? **[8]**

b) What is software quality? Explain with suitable example Measure, Measurement, Metrics and indicator. **[8]**

Q8) Write short notes on : **[18]**

a) The people capability Maturity Model.

b) Software Quality.

c) Risk Management.

Total No. of Questions : 8]

SEAT No. :

P2886

[Total No. of Pages : 2

[4660]-449
M.E. (Computer) (Computer Networking) (Semester - II)
NETWORK PROGRAMMING
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Explain Active-Passive Open and Active-Passive Close in TCP connection establishment and termination using State-Transition diagram in detail. **[10]**

b) Explain ranges of port number allocation in detail? How simultaneous multiple clients request is handled by concurrent server? **[6]**

Q2) a) Compure and Explain various socket address structures in details with neat diagram? **[8]**

b) Explain Byte ordering functions and Byte manipulation functions in detail. **[8]**

Q3) a) Explain the Socket functions for elementary TCP client/server connection establishment? Why TCP maintains two queues for listening socket? **[8]**

b) Explain types of messages exchanged by routing socket? Explain how to fetch and print routing table entry? **[8]**

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

a) Server Host-Crashing, Rebooting and Shutdown.

b) Gethostbyname()andgetservbyname().

c) Buffer Size and IP Datagram.

d) UDP Sockets.

P.T.O.

SECTION - II

Q5) a) Draw and Explain IPv6 server on dual-stack host? Expalin IPv6 Address Testing Macros? **[8]**

b) Draw and explain headers of IPv4 and IPv6 in detail. **[8]**

Q6) a) Explain in detail Multicasting on a WAN and also explain multicast socket options. **[8]**

b) Compare and Explain Unicast and Broadcast of a UDP datagram. **[8]**

Q7) a) Explain TCP Preforked server with No Locking and File Locking around accept. **[8]**

b) Explain how threads handle simultaneous conections for web client. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Simple Network Time Protocol.

b) TCP Prethreaded Server.

c) Race Conditions.

d) IPv6 Multicast Address.

Total No. of Questions : 12]

SEAT No. :

P3458

[Total No. of Pages : 3

[4660] - 45

M.E. (Civil) (Hydraulic Engineering)

HYDRO INFORMATICS AND SIMULATION

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

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Define Hydroinformatics. What is the necessity of Hydroinformatics? Explain with example. **[6]**

b) What are different components of hydroinformatics systems? Explain in detail hardware and software components. **[6]**

c) Discuss about design of hydroinformatics system for flood warning. **[6]**

OR

Q2) a) What are network components, peripheral components of a Hydroinformatics system? Explain in brief. **[6]**

b) Discuss the web based hydroinformatics system stating the details about scope, purpose, underlying model, software used in front end back end. **[8]**

c) Explain shortly the numerical modeling in Hydroinformatics. **[4]**

Q3) a) Discuss in detail the interrelation and requirement of multi-criteria decision support systems that are required in Hydraulic Engineering. **[8]**

b) Discuss the design of multi - criteria decision support system for wave watch giving details of information collection, analysis, prediction, estimation, decision - dissemination of the information. **[8]**

P.T.O.

OR

Q4) a) What is a decision support system in water resources engineering? What are its components? What is the role of public sector in decision support system. **[8]**

b) Discuss design of multi - criteria decision support system for flood watch giving details of information collection, analysis, prediction, estimation, decision. **[8]**

Q5) a) Differentiate between physics based modeling and data driven modeling. Give examples of each. **[6]**

b) Discuss design of simulation model for domestic water distribution system giving details of objective, scope, basic formulae used, underlying solution procedure, simulation technique used. **[10]**

OR

Q6) a) Discuss any commercial simulation model. **[6]**

b) Discuss design of simulation model for water inflow at a dam site objective, scope, basic formulae used, and underlying solution procedure and simulation technique used. **[10]**

SECTION - II

Q7) a) Discuss the Concept of GA. **[4]**

b) Write in detail the Principle working of GA. **[6]**

c) How do artificial neural networks compare with statistics? Discuss the terminology used in statistics for the following terms used in ANN? Input, output, training, generalization. **[8]**

OR

Q8) a) Discuss briefly Conjugate gradient algorithm. **[4]**

b) Define epoch, epoch size, error function, weight surface. **[6]**

c) Define transfer function. What is its use in ANN? Applications of ANN in Canal design. **[8]**

Q9) a) What is evolutionary computing? Explain 3 criteria for evolutionary process to occur. What are different types of evolutionary computing. **[8]**

b) Discuss Fitness function, population, terminals and functions in connection with the Genetic Algorithm. **[8]**

OR

Q10) a) What are the steps in implementation of Genetic Algorithm? **[8]**

b) What is mutation and cross over? Give an example of both by drawing the tree diagram. **[8]**

Q11) a) Define soft computing techniques. Is Genetic Algorithm a soft computing technique? What is the difference between Genetic Algorithm and Genetic Programming? **[8]**

b) What are strengths and limitations of Artificial Neural Networks. **[8]**

OR

Q12) a) Discuss a study about application of Artificial Neural Networks in Water Resources Engineering giving details about problem definition, objective, data, inputs outputs, algorithm used and results. **[8]**

b) Discuss a study about application of Genetic Algorithm in Water Resources Engineering giving details about problem definition, objective data, inputs, outputs and results. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2887

[Total No. of Pages : 2

[4660]-450
M.E. (Computer Networking)
B : NETWORK DESIGN, MODELING AND ANALYSIS
(2008 Pattern) (Elective - III)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) There are 150 terminals feeding a network node. Each terminal sends one transaction every 3 minutes, while the node can only process 60 transactions per minutes. What is the probability that there are no more than 60 transactions arrival per minute? **[8]**

b) How many ways two out of seven computer engineers be assigned to a new project? **[8]**

Q2) a) Message arrive to a system at the rate of 10 per minute. Length of messages are exponentially distributed with average of 3600 characters on a transmission channel of 9600 bps. Compute **[8]**

i) Average Service time.

ii) Service rate.

iii) Utilization of server.

iv) Probability that there are two messages in the system.

b) Explain and derive the M/M/m : m - server case in details. **[8]**

Q3) a) State and prove the Little Theorem. Explain any two applications of Little Theorem. **[8]**

b) Explain the alternate way to compute throughput of M/M/1/N. **[8]**

P.T.O.

Q4) Write short notes on (any 3) : **[18]**

a) Markov chains applications in circuit switching.

b) Reservations and polling.

c) Poisson Arrival model.

d) Queueing in the network layer.

SECTION - II

Q5) a) What is the smallest number of lines which allows an ordered load of 0.5 erlongs to suffer no worse than 2% Lost. **[8]**

b) Explain the Multipoint Line Topology problem in the design of centralized network. **[8]**

Q6) a) Explain ESAV-Williams algorithm with an example. **[8]**

b) Explain in brief queueing network model of nodes in PSN. **[8]**

Q7) a) Explain duties and responsibilities of network administrators. **[8]**

b) Expalin Network planning and implementation for IT system. **[8]**

Q8) Write short notes on (any 3) : **[18]**

a) Security issues in Network design.

b) Terminal assignments.

c) Performance analysis of DLL.

d) Network virtualization.

Total No. of Questions : 8]

SEAT No. :

P3283

[Total No. of Pages : 3

[4660] -451

M.E. (Computer) (Computer Networks)

INFRASTRUCTURE MANAGEMENT

(2008 Course) (Semester - II) (Elective - IV) (510312 A)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any THREE questions from each section.***
2) ***Answers to each section should be written on separate sheet.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What do you mean by infrastructure management? Explain infrastructure management activities. **[8]**

b) What do you mean by total cost of ownership? What are the complexity issues involved in it? **[8]**

Q2) a) Explain the process of identifying system components to manage. Enlist of these components. **[8]**

b) Enlist and explain the factors to consider in designing IT infrastructure. **[8]**

Q3) a) What are the benefits of financial management? Explain the two value concepts defined by ITIL for service valuation. **[8]**

b) What is the objective of service level management? Explain in brief. **[4]**

i) Goals

ii) Scope

iii) Value for the business

of service level management.

c) What is change management? Explain the goals and objectives of change management. **[6]**

P.T.O.

Q4) Write Short notes on ANY TWO: **[16]**

a) Evolution of systems.

b) Current system demands and IT system issues

c) Information Technology Infrastructure Library (ITIL).

SECTION - II

Q5) a) What is incident management? Explain the activities in incident management process. **[10]**

b) Explain the interface of following processes with problem management: **[8]**

i) Service Transitions

ii) Service design

iii) Continual Service improvement

iv) Service strategy

Q6) a) What is capacity management? Explain following three sub-processes of capacity management: **[8]**

i) Business capacity management

ii) Service capacity management

iii) Component capacity management.

b) Explain how availability management is related with following system management processes: **[8]**

i) Incident and problem management

ii) Capacity management

iii) IT service continuity management

iv) Service level management.

Q7) a) Explain the concept of firewall. How firewall is useful in securing IT infrastructure. **[4]**

b) Explain usability of Space management process in the context of infrastructure management. **[8]**

c) Explain in brief the goals, objective and scope of IT services continuity management. **[4]**

Q8) Write short notes on Any TWO: **[16]**

a) Backup and restore.

b) LDAP.

c) Service Desk.

☼ ☼ ☼

Total No. of Questions : 8]

SEAT No. :

P2888

[Total No. of Pages : 2

[4660]-452
M.E. (Computer) (Computer Networks) (Semester - II)
CONVERGENCE TECHNOLOGY
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is meant by Convergence? Explain the benefits of converged networks. **[8]**

b) What is Switching? Explain the difference between Circuit Switching and Packet Switching. **[8]**

Q2) a) Explain ISDN protocol stack in detail with neat sketches. **[8]**

b) Explain the approaches used for setting up frame relay connections and describe the protocol used for connection control. **[8]**

Q3) a) Draw and explain ATM Cell Format at network-network interface. **[8]**

b) Explain the need for explicit congestion avoidance technique. Explain the significance of FECN and BECN bit in Frame relay networks with example. **[8]**

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

a) Q. 931 call setup process.

b) VOIP Applications.

c) Step-by-step PVC example of how an ATM network processes cell.

d) MEGACO.

P.T.O.

SECTION - II

Q5) a) Explain the effect of congestion on FR network with load Vs throughput and load vs Delay. Also explain the Rate-Based and Window-Based Control. **[8]**

b) Draw and explain B-ISDN architecture. Is there a need to enhance or otherwise modify Signaling System Number 7 to support broadband ISDN? **[8]**

Q6) a) During traffic contract management. What is the role of CAC? Justify that the CAC mechanism acts as a preventive congestion control mechanism. **[8]**

b) Explain VOIP technology. Describe is features and benefits. **[8]**

Q7) a) Session initiation protocol is very important in multimedia communication Justify, enlist the benefits of sip. **[8]**

b) Explain the interconnection of MGCP with PSTN, H.323 & SIP. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Net Meeting.

b) Session Initiation Protocol.

c) H. 323 protocol.

d) Media Gateway Control.

Total No. of Questions : 8]

SEAT No. :

P2889

[Total No. of Pages : 4

[4660] - 454
M.E. (Chemical)
APPLIED STATISTICS FOR CHEMICAL ENGINEERS
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Compute mean, median and mode from the following data. **[8]**

Income (Rs.)	No. of Persons
10,000	72
20,000	67
30,000	59
40,000	50
50,000	36
60,000	21
70,000	9
80,000	3

b) Prices of a particular item in 10 years in two cities are given below. Which city has more stable prices? **[8]**

City A	City B
55	108
54	107
52	105
53	105
56	106
58	107
52	104
50	103
51	104
49	101

P.T.O.

Q2) a) Calculate Bowley's coefficient of Skewners from the following data

Profits (Rs.Crores)	10-20	20-30	30-40	40-50	50-60
No.of Companies	15	20	30	10	5

[8]

b) The following data relate the prices and supplies of a commodity during a period of eight years. Calculate the coefficient of correlation between the two series.

Price (Rs. / kg)	Supply (100kg)
10	30
12	35
18	45
16	44
15	42
19	48
18	47
17	46

[8]

Q3) a) A survey was conducted to study the relationship between expenditure on accomodation (X) and expenditure on food (Y) and the following results were obtained.

	Mean	SD
X	173	63.15
Y	47.8	22.98

Coefficient of correlation = + 0.57. Write down equation of regression of X on Y and estimate the expenditure on food, if that on accomodation is Rs. 200 **[8]**

b) From the following two regression equations, calculate the mean values of X & Y and the coefficient of correlation between X & Y.

4 Y – 5 X = 0, 5 Y – X = 63. **[8]**

Q4) Write short notes on the following : **[18]**

a) ANOVA analysis.

b) Rank correlation.

c) Quartiles and quartile deviation.

SECTION - II

Q5) a) Random samples of 200 bolts manufactured by machine 'A' and 100 bolts manufactured by machine 'B' showed 19 & 5 defective bolts respectively. Is there a significant difference between the performance of two machines? (Take Z α = 2.58). **[6]**

b) A sample of 10 measurements of the diameters of a sphere gave a mean of $\bar{X} = 4.38''$ and S.D.$=0.06''$.

Find:

i) 95% & ii) 99% Confidence limits for the actual diameter. **[6]**

c) Two groups of students are given an intelligence test (X) and an arithmatic test (Y).

	n_1	r
X	45	0.45
Y	39	0.08

Is the difference between the values of r significant? **[6]**

Q6) a) Two different types of drugs A & B were tried on certain patients for increasing weight. Five persons were given drug A and seven persons were given drug B. The increase in weight in kg is given below

Drug A : 8 12 13 9 3

Drug B : 10 8 12 15 6 8 11

Do the two drugs differ significantly with regard to their effect in increasing weight. Take $T_{0.05}$ (υ = 10) = 2.23. **[8]**

b) The following grades were given to a class of 100 students :

Grade :	A	B	C	D	E
Frequency :	14	18	32	20	16

Test the hypothesis if $\chi^2_{0.05}(\upsilon=4)=10$. **[8]**

Q7) a) A special type of fertilizer was used in four agricultural fields A, B, C & D. Each field was divided in to four beds and the fertilizer was applied over them. The respective yields of the beds of four fields are given below. Find whether the difference in mean yields of fields is significant or not?

$\left(\text{Take } F_{0.05}(\upsilon_1 = 3_1, \upsilon_2 = 12) = 874\right)$

Plot yield

A	B	C	D
8	9	3	3
12	4	8	7
1	7	2	8
9	1	5	2

[10]

b) Distinguish between one-way and two-way ANOVA. **[6]**

Q8) Write short notes on the following : **[16]**

a) Simplex method of optimization.

b) Assignment problem.

c) Factorial method of design of experiments.

Total No. of Questions : 8]

SEAT No. :

P2891

[Total No. of Pages : 2

[4660]-456
M.E. (Chemical)
ADVANCED SEPARATION PROCESSES
(2008 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) What is the difference between conventional and non conventional separation processes? Explain in detail with a example. **[16]**

Q2) Discuss in detail about recent advances in separation techniques based on surface properties with a example. **[16]**

Q3) What are the equipments used in dual functional filter? Explain. **[16]**

Q4) Write short notes on : **[18]**

a) Nanofiltration

b) Donan Dialysis

SECTION - II

Q5) a) What are the types of membranes?

b) Explain plate and frame membrane filter in detail.

[16]

P.T.O.

Q6) Explain hollow fibre membrane reactor with neat figure. **[16]**

Q7) What is adsorption? Explain Langmuir adsorption Isotherm with figure. **[16]**

Q8) Write short notes on : **[18]**

a) Pervaporation

b) Iyophilization

Total No. of Questions : 8]

SEAT No. :

P3284

[Total No. of Pages : 3

[4660]-457
M.E. (Chemical)
a-COMPUTATIONAL FLUID DYNAMICS
(509104) (2008 Pattern) (Semester-I) (Elective-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) From the fundamental principles, derive the following momentum balance equation for the fluid in motion over a control volume by integral analysis:**[16]**

$$\rho \partial U / \partial t + \rho (U.\nabla U) = -\nabla P + \rho g + \mu \nabla^2 U$$

where

ρ is fluid density

μ is viscosity of fluid

g is acceleration due to gravity

P is fluid pressure

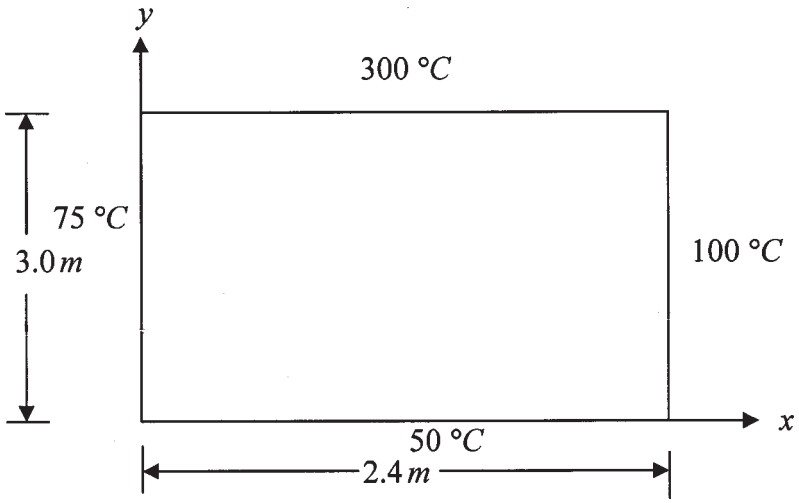
$U = [u\ v\ w]^T$ is the velocity vector for velocities in x, y and z directions respectively.

Q2) Using differential analysis, derive 3-Dimensional equation of energy for horizontal fluid flow. **[16]**

P.T.O.

Q3) A plate 2.4m × 3.0m is subjected to temperatures as shown in following figure. Use a square grid length of 0.6m. Using the Finite Difference Method, find the temperature at the interior nodes.

Use governing equation as: $\frac{\partial^2 T}{\partial x^2}+\frac{\partial^2 T}{\partial y^2}=0$. **[16]**



Q4) Write short notes on (Any Three): **[18]**

a) Solution of 1-D unsteady diffusion Equation.

b) Errors in all stages of CFD simulation.

c) Lagrangian and Eulerian View Points.

d) Grid generation methods.

e) Discretization of 2-D Laplace Equation.

SECTION-II

Q5) What are the characteristics of turbulent flows? Using averaging techniques derive Reynolds Averaged Navier-Stokes Equation for turbulent flow. **[16]**

Q6) Describe in detail the Finite Volume Method for solving following diffusion equation with Dirichlet boundary conditions: **[16]**

$$\frac{d}{dx}\left(k\frac{dT}{dx}\right)+\frac{d}{dy}\left(k\frac{dT}{dy}\right)+S=0.$$

Q7) What are the different approaches in modeling multiphase flows? Describe in detail the homogeneous flow modeling with assumptions and relevant equations. **[16]**

Q8) Write short notes on (Any Three): **[18]**

a) Consistency, stability and convergence.

b) Solution techniques for Wave Equation.

c) Governing Equations in Cartesian co-ordinates and associated BCs.

d) Reynolds Averaged Continuity Equation.

e) Finite Volume Method.

●●●●●

Total No. of Questions : 8]

SEAT No. :

P3450

[Total No. of Pages : 2

[4660] - 458

M.E. (Chemical) (Semester - I)

Process Design and Synthesis

(2008 Pattern) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer to the two Sections should be written in separate answer sheets.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Explain the importance of concepts in process Design and Synsthesis for Chemical Engineers **[8]**

b) Discuss the important parameters in selection of reactor. **[8]**

Q2) a) Describe the engineering ethics for process engineering. **[8]**

b) Write a note on heat and power integration. **[8]**

Q3) a) What is life cycle of process, explain with suitable example. **[8]**

b) Discuss how environmental aspects are considered in process design in chemical industry. **[8]**

Q4) a) Discuss the approaches for process design. **[10]**

b) Describe the pinch point approach used for designing a heat exchanger network. **[8]**

P.T.O.

SECTION - II

Q5) a) Write a note on the pinch point approach. **[8]**

b) Explain the following terms **[8]**

i) Trade off

ii) Performance target

iii) Process engineering economics

iv) Sharp splits

Q6) a) Describe the residue curve map used for azeotropic systems with example. **[8]**

b) Explain the criteria for selection of separation methods. **[8]**

Q7) a) What are residue curve maps? Explain the topology for them. **[8]**

b) Explain reactive separation processes with suitable example. **[8]**

Q8) a) Explain distillation column sequencing for 4 components mixture. **[10]**

b) What is attainable region approach? Explain how it is used in reactor network design. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3449

[Total No. of Pages : 2

[4660] - 459

M.E. (Chemical Engineering) (Semester - I)

ADVANCED THERMODYNAMICS

(2008 Pattern) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Write in brief about microstates and macrostates. **[8]**

b) What are internal energy levels? **[8]**

Q2) a) Give the statistical analog of entropy. **[10]**

b) State how Thermodynamic probability is used in Thermodynamics. **[8]**

Q3) a) Explain the Bose Einstien statistics. **[8]**

b) What are translational and rotational energy levels? **[8]**

Q4) a) Explain the Boltzmann distribution law. **[8]**

b) What is partition function? Give the relation between partition function and the Thermodynamic functions of ideal gases. **[8]**

P.T.O.

SECTION - II

Q5) a) Give the importance of Sackur - Tetrode equation. **[8]**

b) What is the Seebeck effect? **[8]**

Q6) a) Give the Onsager Reciprocal Relation and explain it. **[8]**

b) Explain the phenomena of entropy generation in irreversible thermodynamics. **[8]**

Q7) a) What is rotational partition function? Derive the necessary equation. **[9]**

b) Describe the Peltier effect. **[9]**

Q8) a) Explain the rigid rotor concept and how it is used. **[10]**

b) Give the statistical analog of Helmholtz energy. **[6]**

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Total No. of Questions :6]

SEAT No. :

P2750

[Total No. of Pages :2

[4660]-46
M.E. (Civil -Hydraulic Engineering)
c - HYDROPOWER
(2008 Course) (Elective - II) (Semester - I) (501305)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) What is 'zero load shedding' model. State steps to be taken to achieve the same. **[4+8]**

b) Discuss the limitations of hydropower in detail. **[5]**

c) A family has six rooms and the electricity consumption is as follows. Calculate monthly electricity bill in terms of units. **[8]**

i) In each room, there are two lights (totaling 100W and usage 4 hrs per day) and one fan of 50 W (usage 6 hrs per day).

ii) One refrigerator of 220 W and usage is 20 hrs per day.

iii) One AC of 1400 W and usage is 4 hrs per day.

iv) One geyser of 1000 W and usage is 2 hr per day.

v) One TV of 160 W and usage is 5 hrs per day.

vi) One mixer of 50 W and usage is 1 hr per day.

vii) One electric iron of 550 W and usage is 1 hr per day.

P.T.O.

Q2) a) State various components of storage power plant and explain in detail 'dam' as one of the components. **[8]**

b) With the help of a load curve discuss the efficient use of power generation scheme shared by hydro, thermal and nuclear power plant. **[10]**

c) Write a short note on peak load plants. **[7]**

Q3) a) Explain with sketch 'Irrigation cum power outlet'. **[10]**

b) Write a short note on:

i) Economics of Lake Tapping Project. **[7]**

ii) Effect on power generation of Increase of elevation of powerhouse base and equal increase of height of draft tube. **[8]**

SECTION -II

Q4) a) Write a note on design of surge tank. **[10]**

b) Briefly explain'Economic Diameter of a Penstocks'. **[5]**

c) With the help of neat sketches, discuss the cycle of water hammer. **[10]**

Q5) a) Determine minimum number of Francis turbines required for a power plant having 250 cumec flow and 25 m head. The generator is directly coupled to the turbine which has specific speed of 250 rpm, efficiency 85%. The frequency of generation is 50 cycles/s and number of poles used is 20. **[8]**

b) Explain the role of draft tube towards increasing the power output. **[10]**

c) Describe governing of reaction turbine with neat sketch. **[7]**

Q6) a) Briefly explain the cost economics of micro hydro. **[10]**

b) Explain various components of a micro hydro development. **[15]**

EEE

Total No. of Questions : 8]

SEAT No. :

P2892

[Total No. of Pages : 2

[4660]-460
M.E. Chemical
COMPUTER AIDED DESIGN
(2008 Pattern) (Elective - I (d))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Discuss the Elements of Computer System with respect to Central Processors, Data storage, Alphanumeric input and output, Graphical I/o Basic software, Operating system, Models of operation. **[16]**

Q2) Discuss Bubble point and drew point calculations. **[16]**

Q3) Enlist the components of CAD packages. **[16]**

Q4) Explain the concept of steam tearing and convergence blocks in simulation **[18]**

SECTION - II

Q5) a) Write short note on Liquid - Liquid equilibria. **[9]**

b) Write short note on Vapour - liquid equilibria. **[9]**

Q6) a) Give the algorithm of Computer aided design of adsorption column. **[8]**

b) Draw a flow chart for design of CSTR. **[8]**

P.T.O.

Q7) Discuss with a case study Material balance and energy balance computation using spread sheets. **[16]**

Q8) a) Explain chemcad in detail **[8]**

b) Why simulation results deviates from real results? Explain **[8]**

Total No. of Questions : 8]

SEAT No. :

P3285

[Total No. of Pages : 2

[4660] - 461
M.E (Chemical)
a - INDUSTRIAL POLLUTION CONTROL
(2008 Pattern) (Elective - II) (509105) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Discuss the different factors that must be considered for choice of collection device for air pollutants. **[8]**

b) What is the concept of osmosis and reverse osmosis? Explain in detail the construction and working of reverse osmosis plant. **[8]**

Q2) a) A power plant burns 5 tonnes of coal per hour and discharges the combustion products through a stack that has an effective height of 80 m. The coal has a sulphur content of 4% and the wind velocity at the top of stack is 6 m/s. The atmospheric conditions are moderately to slightly stable. Determine the maximum ground level concentration of SO_2 at a distance of 850m from the stack. Up to distance of 1km from stack, A = 0.295, B = 0.119, P = 0.986 and beyond 1000 m A = 0.295, B = 0.0579, P = 1.09. Also determine the ground level concentration at a distance of 3 km downwind at the centreline of the plume and at a crosswind distance of 0.4 km on either side of the centreline. **[12]**

b) With neat sketches explain the effect of lapse rate on plume behaviour.**[6]**

P.T.O.

Q3) a) Before the installation of an electrostatic precipitator (ESP), the stack gas of power plant contained 6.0 gm particulates / m^3 of gas. The gas flow rate is 350 m^3/min and the new precipitator can remove 2500 kg particulate / day. **[8]**

i) What is emission rate of particulates before and pollution control in kg/day.

ii) What is the efficiency of ESP?

iii) Will the new system meet an emission standard of 0.70 gm/m^3?

b) Describe the elements of conceptual process design for waste water treatment plant. **[8]**

Q4) Explain the environmental pollution caused by a fertilizer industry and discuss the various methods and equipment which can be used for controlling the pollution. **[16]**

SECTION - II

Q5) a) Explain various configurations of activated sludge process and write all the chemical reactions involved during the activated sludge process. **[8]**

b) Differentiate between activated sludge process and trickling filters. **[8]**

Q6) a) 10,000 m^3/day of liquid effluent from food processing industries is to be treated by activated sludge process at 30° C from an initial $(BOD)_5$ of 650 ppm to a final value of 25 ppm. Bench scale studies at 20°C and mixed liquor biomass concentration of 3000 mg/L gave BOD removal rate coefficient of 14(days). Estimate the retention time and size of the unit. temp. Coefficient $\theta_1 = 1.02$. **[10]**

b) Derive an expression for finding the concentration of microorganisms in the effluent in a complete mix reactor without recycle. **[8]**

Q7) a) Explain the sources and classification of solid waste. **[8]**

b) Write a note on waste management hierarchy. **[8]**

Q8) a) Explain different methods for landfilling. **[10]**

b) Explain gasification as a method of solid waste disposal. **[6]**

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

P3478 **[Total No. of Pages :2**

[4660] - 462
M.E. (Chemical)
PROCESS OPTIMIZATION
(2008 Pattern)

Time : 3 Hours] ***[Maximum Marks :100***

Instructions to the candidates:

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

SECTION - I

Q1) Minimize $f(x) = x^3 + (9/x)$. Use

a) Fibonacci Search Method,

b) Secant Method. Write complete algorithm for these methods and demonstrate at least 3 steps towards finding optimized solution for the above function. Do not try to solve it completely. **[17]**

Q2) Write stepwise procedure to formulate a maximization problem for a binary distillation system as under. Benzene and loluene are fed to a distilation column to separate hexane as the 'desired' product at the top. Assume data, if needed. Do not try to solve it. **[17]**

Q3) Maximize $f(x) = x^2 - 15x + 2$ in the interal [-2 3]. Use

a) Newton Raphson Method,

b) Internal halving Method. Write complete algorithm for these methods and demonstrate at least 3 steps towards finding optimized solution for the above function. Do not try to solve it completely. **[17]**

Q4) Write short notes (Any Three) **[16]**

a) Quadratic programming

b) Cubic Search Method

c) Sensitivity Analysis

d) Convexity of a function

P.T.O.

SECTION - II

Q5) Minimize $f(x) = \frac{(x_1 - 1)^2}{16} + \frac{(x_2 - 2)^2}{4} - 1$ **[17]**

Subject to linear constraints

$x_1 \geq 0,\ x_2 \geq 0, 2 - x_1 - x_2 \geq 0, -3 + 3x_1 - x_2 \leq 0$

Q6) State various conditions of deliniteness of a function using Hessian matrix. Find whether the following function is strictly convex/strictly concave. **[17]**

$f(x) = 9x_1^2 + 10x_1x_2 + 3x_1 - 4x_2 - 6x_2^2 + 11$

Q7) Explain the simplex search Method and demonstrate for minimization of

$f(x) = 9x_1^4 + 6x_2^3 - 2$ starting $[x^\circ]^T = [3\ 5]$ in the direction $S^3 = [-2\ -4]^T$, perform 4 steps. **[17]**

Q8) Write short notes (Any Three)

a) Constraints on objective function **[16]**

b) Optimization parameters

c) Parameteric optimization

d) Multivariable optimization

Total No. of Questions : 8]

SEAT No. :

P2894

[Total No. of Pages : 2

[4660]-465

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

PROCESS MODELING AND SIMULATION

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) What is process simulation? Explain the limitations of process simulation. Also explain the usefulness of process simulation. **[16]**

Q2) Develop a model of tripple effect evaporater. Write assumptions. **[18]**

Q3) Derive a model for binary distillation column. **[16]**

Q4) Model a batch reverse osmosis plant. **[16]**

SECTION - II

Q5) a) What is optimization? Give the classification of optimization problems.

b) Write the steps involved in formulation of optimization problems. **[16]**

P.T.O.

Q6) a) What are the different designs of experiment?

b) Explain central factorial design method.

[18]

Q7) Discuss evolutionary operation technique with a case study. **[16]**

Q8) Write short notes on. **[16]**

a) Application of optimization in fluid flow system.

b) Linear & non linear regression Analysis.

Total No. of Questions : 8]

SEAT No. :

P3286

[Total No. of Pages : 3

[4660] - 466
M.E. (Chemical Engg.)
ADVANCED TRANSPORT PHENOMENA
(2008 Course) (Semester - II) (Theory) (509109)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Water enters a boiler at 18.33°C and 137.9kPa through a pipe at an average velocity of 1.52m/s. Exit stream at a height of 15.2m above the liquid inlet leaves at 137.9kPa, 148.9°C and 9.14m/s in the outlet line. At steady state, how much heat must be added per kg mass of stream? Assume the flow in the two pipes as turbulent? **[10]**

b) Discuss Newton's low of viscosity and the Rheological behaviour of Non-Newtonian fluid. **[6]**

Q2) a) Derive the equation of motion and discuss the theory of thermal conductivity of the liquids. **[8]**

b) Derive the equation of continuity in three dimensional coordinate, for a flow of a fluid through isothermal systems. **[8]**

Q3) a) A solid sphere 0.0254 m in diameter is placed in an otherwise undisturbed air stream, which approaches at a velocity of 30.48 m/s, a pressure of 1 atm and temperature of 37.7°C. The sphere surface is maintained at 93.33°C by means of an embedded electric heating coil. What must be the rate of electrical heating in W to maintain the stated conditions? **[10]**

Given data at 37.7°C:

$\mu_f = 1.9\times10^{-5}$ NS/m^2, Cp = 1.0048 kJ/kgK,

$K_f = 0.027$ w/mk, $\rho f = 1.137$ kg/m^3

P.T.O.

b) Write short note on time smooth temperature in turbulent flow with neat sketch. **[6]**

Q4) a) Derive the equation of change in the terms of dimensionless numbers, use equation of change in terms of substantial time derivative. **[10]**

b) Heavy oil is passed through a pipe of 0.1667 ft diameter. The pressure drop over a pipe is 68958 N/m^2. The μ_{oil} is 200 cp and density is 800 kg/m^3. The length of a pipe is 10ft. **[8]**

i) Calculate the volumetric flow rate of oil in lit./min.

ii) Plot the momentum flux profile across the pipe.

SECTION - II

Q5) a) Define the heat transfer coefficient, the Nusselt number, the Stanton number, and the Chilton-Colburn j_H. How can each of these be 'decorated' to indicate the type of temperature-difference driving force that is being used? **[8]**

b) What is the physical significance of the fact that the turbulent Prandtl number is of the order of unity? **[4]**

c) What are the characteristic dimensionless groups that arise in the correlation for Nusselt numbers for forced convection? for free convection? for mixed convection? **[4]**

Q6) a) In a catalytic tubular reactor, a dilute solution of solute A in a solvent S is in fully developed laminar flow in the region $z<0$. When it encounters the catalytic wall in the region $0<z<L$, solute A is instantaneously and irreversible rearranged to an isomer B. Write diffusion equation appropriate for this problem and find the solution for short distances into the reactor. Assume that the flow is isothermal and neglect the presence of B. Use the following equations: **[8]**

$$v_z \frac{\partial C_A}{\partial z} = D_{As}\left[\frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial C_A}{\partial r}\right)+\frac{\partial^2 C_A}{\partial z^2}\right]$$

b) A semi-infinite body of liquid with constant density and viscosity is bounded by horizontal surface. Initially the fluid and the solid are at the rest. Then at time $t = 0$, the solid surface is set in motion in the positive x direction with velocity v_0. Find the velocity v_x as a function of y and t. There is no pressure gradient or gravity force in the x direction and the flow is presumed to be laminar. **[8]**

Q7) a) Compare turbulent thermal conductivity and turbulent viscosity as to definition, order of magnitude, and dependence on physical properties of and nature of flow. **[8]**

b) One hundred kg per hour of oil at 100°C are flowing through a 1cm id copper tube, 20 m long. The inside surface of the tube is maintained at 215°C by condensing steam on the outside surface. Fully developed flow may be assumed through the length of the tube, and the physical properties of the oil may be considered constant at the following values: density 55 kg/m^3, Cp = 0.49 kJ/kg°C, viscosity = 1.42 kg/hr, k = 0.0825 kJ/hr m°C. Calculate Pr, Re, the exit temperature of the oil. **[5]**

c) Derive the equation of continuity for a multi-component mixture. **[5]**

Q8) a) Derive the expression for temperature distribution more than one independent variables. **[10]**

b) Estimate the maximum diameter of micro-spherical catalyst particles that could be lost in the stack gas of a fluid cracking unit under the following conditions: **[6]**

Gas velocity at axis of stack =1.0 m/s (vertically upward)

Gas Viscosity = 0.026 cp

Gas density = 0.045 kg/m^3

Density of catalyst particles = 1.2 g/cm^3

Express the results in microns?

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Total No. of Questions : 8]

SEAT No. :

P2895

[Total No. of Pages : 3

[4660] - 467

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

ADVANCED PROCESS CONTROL

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Water enters cylindrical tank having cross - section area 'A' at a rate Qi cc/s and leaves tank at a rate Qo, cc/s through a linear resistance 'R'. Derive input - output and transfer function model for this tank process. **[4]**

b) Derive response of height of liquid inside the tank system for unit step change in inlet flow rate. Sketch the response curve. **[6]**

c) In above system, if A = $1m^2$, Qi = 400 LPH, h(o) = 1m, calculate height of liquid inside the tank after 2 min if input flow rate is suddenly changed to 420 LPH. Also calculate final steady - state level of water inside the tank. **[6]**

Q2) Starting from transfer function model of a second - order system, derive unit step response of **[16]**

a) an underdamped system

b) an overdamped system

c) critically damped system

Sketch the response curves.

P.T.O.

Q3) a) A second - order process having transfer function $Gp = \frac{1}{0.2s^2 + 0.4s + 1}$

is controlled using PI - controller having kc = 2, T_I = 1 min. If Gm = Gf = 1, derive the characteristic equation for the feedback control system. Determine whether closed - loop system is stable or not using Routh test. **[8]**

b) Sketch root locus diagram for a system having open - loop transfer function $GH = \frac{k}{(s+1)(s+2)(s+3)}$

Indicate the break - away point and intersection points with imaginary axis on the diagram. **[8]**

Q4) Write short notes on the following: **[18]**

a) Cascade control.

b) Split - range control.

c) Adaptive control.

SECTION - II

Q5) a) Sketch block diagram for a 2×2 process modeled as

$\bar{y}_1 = G_{11}\bar{m}_1 + G_{12}\bar{m}_2$

$\bar{y}_2 = G_{21}\bar{m}_1 + G_{22}\bar{m}_2$

State transfer function model for this system. **[6]**

b) Derive transfer function model for a multivariable system modeled as $\dot{X}(t) = A\times(t) + B\,U(t) + T\;D(t)$ & $Y(t) = C\times(t)$ **[6]**

c) Find poles and zeros of multivariable system having transfer function

matrix $G(s) = \begin{bmatrix} \frac{1}{s+1} & \frac{1}{s+3} \\ \frac{1}{s+4} & \frac{1}{s+2} \end{bmatrix}$ **[6]**

Q6) State whether the following system is controllable and observable? **[16]**

$$\dot{X} = AX + BU \quad , Y = CX$$

$$\text{Where } A = \begin{bmatrix} -6 & 2 & -4 \\ -18 & 3 & -8 \\ -6 & 1 & -3 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 3 \\ 1 \end{bmatrix}, C = \begin{bmatrix} 1 & -1 & 2 \end{bmatrix}$$

Q7) a) Explain model predictive control (MPC) strategy in detail. State its advantages and limitations over conventional feedback control strategy. **[8]**

b) Explain internal model control (IMC) strategy in detail. **[8]**

Q8) Write short notes on the following. **[18]**

a) Set - point weighted PID controllers.

b) Plantwide control systems.

c) RGA analysis and loop pairing.

Total No. of Questions : 8]

SEAT No. :

P2896

[Total No. of Pages : 2

[4660]-468

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

CATALYSIS AND SURFACE PHENOMENA (Elective - III)

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate answer sheets.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the effect of external transport on isothermal and non - isothermal series reactions. **[8]**

b) Describe chemisorption method for determining metal surface area in supported metal catalyst. **[8]**

Q2) a) What is the significance of Thiele modulus? Derive an equation for any one shape of pore. **[8]**

b) Discuss the preparation of alumina and silica as catalyst supports. Compare them. What is the Hedball effect? **[10]**

Q3) Describe the following methods of catalyst characterization. State the principles involved. **[16]**

a) XRD

b) XPS

Q4) Explain the surface area measurement by BET method. Write all necessary equations and draw suitable diagram. **[16]**

P.T.O.

SECTION - II

Q5) a) Derive an equation for estimating the rate of desorption. **[8]**

b) Write a note on catalyst regeneration. **[8]**

Q6) a) What are spinnels? State their characteristics. **[8]**

b) Explain heat transfer and mass transfer in fluidized bed reactors. **[8]**

Q7) a) Explain the three regions in a catalyst monolith. **[6]**

b) What is the significance of adsorption isotherm? What are the different types of adsorption isotherms? **[10]**

Q8) a) What are different modes of catalyst deactivation? Give their characteristics. **[8]**

b) Develop mathematical treatment for deactivation of systems having multiple reaction network. **[10]**

Total No. of Questions :8]

SEAT No. :

P2751

[Total No. of Pages :3

[4660]-47
M.E. (Civil - Hydraulics)
OPEN CHANNEL HYDRAULICS
(2008 Pattern) (Semester - II) (501308)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) For a rectangular channel of base width B, bed slope S_0 and Manning's roughness coefficient n, show that the maximum value of Froude number for uniform flow occurs when the normal depth y_n is equal to $\frac{B}{6}$. Thereby obtain the expression for the discharge corresponding to the maximum value of Froude number. **[10]**

b) Design the most economic section of trapezoidal channel using the following data: **[8]**

i) Design discharge = 20 m^3 / sec.

ii) Bed slope to be provided = 0.0004.

iii) Side slopes to be provided = 1V = 1.5 H.

iv) The channel is lined with earth for which n = 0.02.

Q2) a) Show that for a hydraulic jump in horizontal, frictionless rectangular channel, the ratio of energy loss ΔE to the critical depth y_c is given as

$$\frac{\Delta E}{y_c} = \left[\frac{(y_r - 1)^9}{32 y_r^4 (y_r + 1)}\right]^{1/3} \quad \text{Where } y_r = \frac{y_2}{y_1}. \qquad \textbf{[8]}$$

P.T.O.

b) An ogee spillway is 45 m high. At the design energy head of 2.8m over the spillway, find the sequent depths and energy loss in a hydraulic jump formed on a horizontal apron at the toe of the spillway. Neglect the energy loss due to friction over the spillway surface. Assume $c_d = 0.75$ for spillway. **[8]**

Q3) A rectangular channel 15 m wide carries a discharge at a normal depth of 2.5m. If at a certain section, due to the construction of a weir, the depth of flow becomes 3.0 m, how far upstream or downstream of this section, would the depth of flow be within 10% of the normal depth. The bed slope of the channel is 0.0004 and Manning's roughness co-efficient is 0.016. Use direct step method taking at least 3 steps. Classify and sketch the resulting profile.**[16]**

Q4) Write brief notes on ANY FOUR of the following: **[16]**

a) Specific energy diagram and specific force diagram;

b) Ven Te Chow's method of GVF computations;

c) Classification of flow profiles in GVF;

d) Factors affecting Manning's roughness co-efficient;

e) Uses of hydraulic jump.

SECTION -II

Q5) a) The depth and velocity of flow in a rectangular channel are 1.2m and 1.8 m/sec respectively. If the discharge is abruptly doubled by sudden lifting of the gate on the upstream side, estimate the velocity and the height of the resulting surge. **[10]**

b) Write brief notes on the following: **[8]**

i) Positive and negative surges.

ii) Dam break problem.

Q6) a) Derive the dynamic equation for spatially varied flow with increasing discharge. **[10]**

b) Explain the profile computations in spatially varied flow. **[6]**

Q7) a) What is stratified flow? Obtain the equation of motion in case of stratified flow. **[8]**

b) State and explain the different exchange co-efficients in detail. **[8]**

Q8) a) What is flood routing? What are the uses of flood routing? Differentiate between channel routing and reservoir routing. **[10]**

b) Briefly explain the following: **[6]**

i) Standing and progressive waves.

ii) Group velocity.

EEE

Total No. of Questions : 8]

SEAT No. :

P2897

[Total No. of Pages : 3

[4660]-470

M.E. (Chemical Engineering) (Semester - II)

MATHEMATICAL METHODS IN CHEMICAL ENGINEERING

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Prove the following equation **[6]**

$$\left[v\times\left[v\times w\right]\right]=v\left(u.w\right)-w\left(u.v\right)$$

b) Write out the following summation **[6]**

i) $\sum_{k=1}^{3} a_k^2$ ii) $\left(\sum_{j=1}^{3} a_j\right)^2$

c) A vector v has components $v_x = 1$, $v_y = 2$ and $v_z = -5$. A vector w has components $w_x = 3$, $w_y = -1$ and $w_z = 1$. Evaluate (v.w), [v x w] and length of v **[6]**

Q2) a) Explain the following terms **[8]**

i) Tensor product of two tensor

ii) Vector product of a Tensor with a vector

b) Derive the equation for ∇v in cylindrical coordinates **[8]**

P.T.O.

Q3) Solve the following using power series method **[16]**

a) $y'' + 2y = 0$

b) $y' + 10y = 0$

Q4) a) Explain the pitfall in Newton Raphson method. Determine the positive root of following equation and an initial guess of x = 0.5 (solve for 4 iterations) **[8]**

$f(x) = x^{10} - 1$

b) Using Naïve Gauss elimination method solve the following equation **[8]**

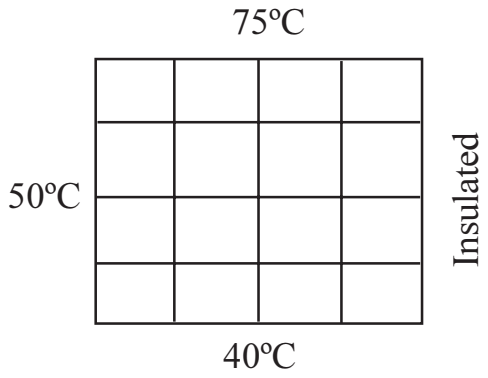
$5x + 13y + 7z = 14$

$3x + 6y + 3z = 9$

$7x + 2y + 4z = 5$

SECTION - II

Q5) Use Liebmann's method to solve for the temperature of heated plate with side edge insulated in figure shown below: **[16]**



Q6) a) Use the explicit method to solve for the temperature distribution of a long thin rod with a length of 10 cm and the following values k = 0.49 cal/(s cm ºC), Δx = 2 cm, Δt = 0, the temperature of rod is zero and boundary conditions are fixed for all times at T(0) = 100ºC and T(10) = 50ºC. Take C = 0.2174 cal/gºC and ρ = 2.7 g/cm^3. **[10]**

b) Write short note on the finite difference method for solving partial differential equation. **[6]**

Q7) a) Differentiate between finite element and finite difference techniques for solving partial differential equations. **[8]**

b) Write short note on the boundary conditions for partial differential equation. **[8]**

Q8) a) Use suitable numerical method for solving simultaneous differential equations. Assuming that at $x = 0$, $y_1 = 4$ and $y_2 = 6$ with step size of 0.5 (1 iteration)

$dy_1/dx = -0.5y_1$; $dy_2/dx = 4 - 0.3y_2 - 0.1y_1$ **[10]**

b) Differentiate between, explicit, implicit and Crank Nicolson methods used for solving partial differential equations. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2898

[Total No. of Pages : 2

[4660]-472

M.E. (Chemical)

CATALYSIS & SURFACE PHENOMENON

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What is the role of adsorption in catalysis? **[6]**

b) Explain Langmuir adsorption Isotherm. **[6]**

c) What is meant by characterization of catalyst? **[6]**

Q2) a) What information can be obtained from adsorption isotherm? **[8]**

b) Derive and explain Elovich equation. **[8]**

Q3) a) What is porosimetry? **[6]**

b) Explain the XRD technique. **[6]**

c) What is the effect of pore size distribution on catalysis? **[4]**

Q4) a) Compare LHHW and E - R mechanisms. **[8]**

b) Explain the terms : **[8]**

i) Active ingradients in catalysts

ii) Supporting materials in catalysts and

iii) Catalyst activation.

P.T.O.

SECTION - II

Q5) a) What is the significance of Thiele Modulus? Derive it for any one shape of catalyst. **[8]**

b) Discuss about non - iso thermal behaviour in catalyst pellets and derive an equation for $(T_s - T_b)$ **[8]**

Q6) a) What is meant by catalyst poisioning? What are the different types of poisions? **[8]**

b) Describe the steady state model for catalyst poisioning. Derive the equation for relative activity (F). **[10]**

Q7) a) Which catalyst is used in Methanol synthesis? What is the role of oxides supports. **[8]**

b) Describe the catalytic monolith. **[8]**

Q8) a) What is the significance of effectiveness factor? **[6]**

b) What is the importance of catalyst regeneration? **[5]**

c) What is sintering of catalyst? **[5]**

Total No. of Questions : 8]

SEAT No. :

P3482

[Total No. of Pages : 3

[4660] - 473

M.E. (Chemical)

PROCESS OPTIMIZATION

(2008 Pattern) (Elective - IV)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:-

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

SECTION - I

Q1) Minimize $f(x) = x^3 + x^2 + 24/x$. **[16]**

Use a) Fibonacci Search Method

b) Golden Search Method

Write complete algorithm for this method and demonstrate at least 3 steps towards finding optimized solution for the above function $f(x)$.

Q2) Minimize $f_x = x^3 + \frac{9}{(2+x)} + \frac{1}{(3+x^2)}$. Use Fibonacci Search Method.

Write complete algorithm for this method and demonstrate at least 3 steps towards finding optimized solution for the above function. Do not try to solve it. Completely. **[16]**

P.T.O.

Q3) A typical plug flow reactor is an example of a set of ordinary and partial differential equations. Typical constraints on such a problem are of the physical type based on dimensions of unit, of systems type based on the physicochemical considerations. Considering above, construct a problem around a pug flow reactor and identify the objective function, constraints. Also discuss the strategy to get optimized solution out of it. **[16]**

Q4) Write short notes (any Three) : **[18]**

a) Concavity Vs Convexity of a function.

b) Internal halving method

c) Gradient based method

d) Lagrangian multipliers

SECTION - II

Q5) State various conditions of definiteness of a function using Hessian matrix. Find whether the following function is strictly convex / strictly concave. **[16]**

$f(x) = 2x_1^2 + 5x_1x_2 + 12x_1 + 13x_2 - 4x_2^2 + 9$.

Q6) Explain the Simplex Search Method and demonstrate for minimization of $f(x) = 2x_1^2 + 3x_2^2 + 3$ and starting at $(x^o)^T = [1\ 1]$ in the direction $S^o = [-4\ \ -1]^T$. Perform four steps. **[16]**

Q7) A distillation column has available two feed streams that have the yields shown in the table. Because of equipment and storage limitations, production of butane, toluene and hexane must be limited as shown in the table. The profit on processing feed no. 1 is Rs. 25/ton and on feed no. 2 it is Rs. 15/ ton. Find the approximate optimum daily feed rates of the two feeds to the distillation column. **[16]**

	Volume percent yield		Maximum allowable rate, Tons/day
	Feed no. 1	Feed no. 2	
Butane	55	35	3500
Toluene	25	48	2900
Hexane	20	17	8000

Q8) Write short notes (Any Three) : **[18]**

a) Kuhn Tucker conditions

b) Weighted parameters

c) Sensitivity analysis

Total No. of Questions : 8]

SEAT No. :

P3481

[Total No. of Pages : 2

[4660]-474
M.E. (Chemical)
FUEL CELL TECHNOLOGY
(2008 Pattern) (Elective)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Derive Butler Volmer equation used to predict current generated in a fuel cell. When mass transfer limitations are overcome. **[16]**

Q2) For diffusion controlled unidirectional process the current generated in a fuel cell is calculated using Cottrel equation. Using Cottrel equation find out thevariation of the current in the external circuit with time for following cell. Given :: n =1, $D_{AB} = 6.1 \times 10^{-5}$ cm^2/sec, A = Cross Sectional area = 0.2 cm^2, ∂ = Film thickness = 15 μm. **[16]**

Q3) Compare polymer electrolyte membrane fuel cell and solid oxide fuel cell. Describe the construction and working of any one of them. **[16]**

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

a) Nernst equations

b) Faraday's Law

c) Military Applications of fuel cells

d) Ohmic Polarization

P.T.O.

SECTION - II

Q5) Describe improvements in the fuel cell performance of present day hydrogen & oxygen based fuel cell over coal derived fuel gas based fuel cell at premature stages of development of fuel cells. **[16]**

Q6) Explain in details the principle on which a fuel cell is designed. Give details of general electrode reactions and emf generated such a cell. **[16]**

Q7) What are various applications of fuel cells? What are the problems in commercializing them for onshore applications? **[16]**

Q8) Write short notes on any three **[18]**

a) Tafel plot

b) Application of Fick's Law in Electrochemistry

c) Anodic reactions

d) Half Cell Potential

Total No. of Questions : 8]

SEAT No. :

P3285

[Total No. of Pages : 2

[4660] - 474A
M.E (Chemical)
a - INDUSTRIAL POLLUTION CONTROL
(2008 Pattern) (Open Elective - IV) (509105) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Discuss the different factors that must be considered for choice of collection device for air pollutants. **[8]**

b) What is the concept of osmosis and reverse osmosis? Explain in detail the construction and working of reverse osmosis plant. **[8]**

Q2) a) A power plant burns 5 tonnes of coal per hour and discharges the combustion products through a stack that has an effective height of 80 m. The coal has a sulphur content of 4% and the wind velocity at the top of stack is 6 m/s. The atmospheric conditions are moderately to slightly stable. Determine the maximum ground level concentration of SO_2 at a distance of 850m from the stack. Up to distance of 1km from stack, A = 0.295, B = 0.119, P = 0.986 and beyond 1000 m A = 0.295, B = 0.0579, P = 1.09. Also determine the ground level concentration at a distance of 3 km downwind at the centreline of the plume and at a crosswind distance of 0.4 km on either side of the centreline. **[12]**

b) With neat sketches explain the effect of lapse rate on plume behaviour.**[6]**

P.T.O.

Q3) a) Before the installation of an electrostatic precipitator (ESP), the stack gas of power plant contained 6.0 gm particulates / m^3 of gas. The gas flow rate is 350 m^3/min and the new precipitator can remove 2500 kg particulate / day. **[8]**

i) What is emission rate of particulates before and pollution control in kg/day.

ii) What is the efficiency of ESP?

iii) Will the new system meet an emission standard of 0.70 gm/m^3?

b) Describe the elements of conceptual process design for waste water treatment plant. **[8]**

Q4) Explain the environmental pollution caused by a fertilizer industry and discuss the various methods and equipment which can be used for controlling the pollution. **[16]**

SECTION - II

Q5) a) Explain various configurations of activated sludge process and write all the chemical reactions involved during the activated sludge process. **[8]**

b) Differentiate between activated sludge process and trickling filters. **[8]**

Q6) a) 10,000 m^3/day of liquid effluent from food processing industries is to be treated by activated sludge process at 30° C from an initial $(BOD)_5$ of 650 ppm to a final value of 25 ppm. Bench scale studies at 20°C and mixed liquor biomass concentration of 3000 mg/L gave BOD removal rate coefficient of 14(days). Estimate the retention time and size of the unit. temp. Coefficient $\theta_1 = 1.02$. **[10]**

b) Derive an expression for finding the concentration of microorganisms in the effluent in a complete mix reactor without recycle. **[8]**

Q7) a) Explain the sources and classification of solid waste. **[8]**

b) Write a note on waste management hierarchy. **[8]**

Q8) a) Explain different methods for landfilling. **[10]**

b) Explain gasification as a method of solid waste disposal. **[6]**

Total No. of Questions : 8]

SEAT No. :

P2893

[Total No. of Pages : 2

[4660]-474B

M.E. Chemical (Semester - I)

D : FLUIDIZATION ENGINEERING

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Define fluidized state and regimization of fluidized state. Discuss the same. **[8]**

b) What are the applications of fluidization system? **[8]**

Q2) a) Discuss Hydrodynamics of fluidization systems. **[10]**

b) Discuss the operating model for fluidization system. **[8]**

Q3) Explain the following in details;

a) Incipient fluidization. **[8]**

b) Pressure fluidization **[8]**

Q4) What are the different flow models? Discuss the generalized wake model and Davidson model. **[16]**

P.T.O.

SECTION - II

Q5) Discuss the following in details and write all necessary equations:

a) 2 phase & 3 phase inverse fluidized bed. **[9]**

b) Immersed horizontal cylinder - to - bed heat transfer. **[9]**

Q6) Derive the kinetic model for conversion of shrinking and growing particle in fluidization . **[16]**

Q7) Write short notes on:

a) Modeling by bed collapsing. **[8]**

b) Geldart's classification for power assessment. **[8]**

Q8) Discuss the following in details and write all necessary equations.

a) Liquid - solid mass transfer in fluidization. **[8]**

b) Immersed vertical cylinder - to - bed heat transfer. **[8]**

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

P3334 **[Total No. of Pages :3**

[4660] - 475

M.E. (Environmental Engg.)

APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERS

(2008 Pattern)

Time : 3 Hours] ***[Maximum Marks :100***

Instructions to the candidates:

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

SECTION - I

Q1) Obtain the rank correlation coefficient between the variables X and Y from the following pairs of observed values. **[16]**

X	50	55	65	50	55	60	50	65	70	75
Y	110	110	115	125	140	115	130	120	115	160

Q2) 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 distributed over three different models of washing machines.

	Machine1	Machine2	Machine3	Total
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

P.T.O.

Looking on the detergents as a treatements 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. **[16]**

Q3) Explain in detail correlation and Autocorrelation with suitable examples and its plots. **[16]**

Q4) Prove that F distribution is unimodal at the Value $\left(\frac{V_1-2}{V_1}\right)\left(\frac{V_2}{V_2+2}\right)$ if $V_1 > 2$. **[18]**

SECTION - II

Q5) From a population of 75 items with a mean of 364 and a variance of 18,32 items were randomly selected without replacement. Calculate

a) The standard error of the mean

b) The $P(363 \le \bar{x} \le 366)$ **[16]**

Q6) a) State and explain the assumptions in analysis of variance. **[8]**

b) What is analysis of variance in two way classification model. **[8]**

Q7) Write short notes on **[18]**

a) Northwest Corner Rule

b) Least cost rule

c) Transportation algorithm

Q8) a) What are unbound solutions in a simplex method. **[8]**

b) Maximize $Z = 5x_1 + 4x_2$ **[8]**

Subject to

$$6x_1 + 4x_2 \leq 24$$

$$x_1 + 2x_2 \leq 6$$

$$-x_1 + x_2 \leq 1$$

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

Use graphical method

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Total No. of Questions: 8]

SEAT No. :

P3337

[Total No. of Pages : 2

[4660] - 478
M.E. (Environmental Engg.) (Semester - I)
A: MODELING OF ENVIRONMENTAL SYSTEMS (Elective - I)
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Discuss various models of Environmental systems with suitable examples. **[16]**

Q2) a) What is sensitivity analysis. **[8]**

b) Explain how numerical methods play a role in environmental systems modeling. **[8]**

Q3) a) Discuss types of reaction and order of reaction. **[8]**

b) How mass, momentum and energy conservation is exploited for modeling. **[8]**

(P.T.O)

Q4) a) Discuss various aspects of air pollution metrology. **[9]**

b) Explain Gaussian plume model and state its limitations. **[9]**

SECTION - II

Q5) a) How simulations of special metrological and topographic conditions are useful. **[8]**

b) Explain model calibration and validation in detail. **[8]**

Q6) Explain phenomena of climate change and how it is modeled. **[16]**

Q7) a) State the importance of hydrodynamics of rivers for modeling the system. **[8]**

b) How Environmental systems are classified. **[8]**

Q8) Write short note on **[18]**

a) Modeling objectives.

b) DO model.

c) Temperature model.

Total No. of Questions : 8]

SEAT No. :

P2899

[Total No. of Pages : 3

[4660]-479

M.E. (Chemical) (Environmental Engg.)

B : GROUNDWATER CONTAMINATION & POLLUTION TRANSPORT

(2008 Pattern) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain the movement of water through hydrologic cycle and explain the components of hydrologic cycle responsible for formation of groundwater. **[6]**

b) Explain briefly hydrologic properties of subsurface formation which effect water bearing characteristics of rocks. **[6]**

c) What is groundwater contamination? Discuss the various routes for groundwater contamination. **[6]**

Q2) a) State the Darcy law & its limitation. Discuss the range of validity of Darcy's law. **[4]**

b) Groundwater movement influences geotechnical problems - Discuss. How does groundwater withdrawl influence land subsidence & what are related remedial measures. **[6]**

P.T.O.

c) During a core drilling of an confined aquifier, it was found to consist of 3 layers. Bottom layer was 3.8m thick of coarse sand & had a hydraulic conductivity of 0.05cm/sec, intermediate layer was of fine sands 2.5m thick & had a hydraulic conductivity of 0.003cm/s. The top gravel layer was 3.2m thick with a hydraulic conductivity of 3.5cm/s. Calculate the equivalent hydraulic conductivity of confined aquifier when **[6]**

i) Flow is along stratification &

ii) Perpendicular to stratification

Q3) a) Derive the mass conservation equation in 3D for transient flow in a saturated porous medium **[6]**

b) Explain principle of superposition as applied for a 2D steady flow & its application. **[6]**

c) Explain the concept of Regional ground water flow & discuss the application of conceptual models for analysis. **[4]**

Q4) a) Discuss the approach to solve the groundwater flow equation subjected to different types of boundary condition encountered in flow through porous medium. **[6]**

b) Show that for the flow through homogenous & isotropic media. **[6]**

$$\phi = Klt\left(\frac{n_f}{n_d}\right)$$

Where n_f = no of flow channel

n_d = no of potential drop

c) What are the objectives of aquifier test? Discuss the steady state & unsteady state flow conditions. **[4]**

SECTION - II

Q5) a) Distinguish cleary between the point source & non point source of contamination giving examples of each type. **[6]**

b) Explain geochemical cycle of surface & ground water flow sytem. **[6]**

c) Discuss important phenomenon responsible for pollution transport from land into water body. **[4]**

Q6) a) What are the needs & necessities of artificial Recharge of groundwater. Derive the condition for groundwater table slope for large capacity flow into a single well near stream. **[6]**

b) Discuss the role of **[6]**

i) Advection

ii) Molecular diffusion &

iii) Mechanical dispersion in contamination transport.

c) Explain the seasonal & secular variation of ground water. **[4]**

Q7) a) Discuss landfilling of urban solid waste with a schematic representation of pretreatment before land filling. **[6]**

b) Explain aerobic & anaerobic degradation of land fills. **[6]**

c) What is chemical equilibrium & give the governing equation of chemical equilibrium? Discuss the various factors that alter equilibria. **[6]**

Q8) a) Answer any 2 of the following **[12]**

i) Artificial Recharge of groundwater by spreading.

ii) Groundwater pollution control by grooting

iii) Retardation.

b) Discuss Sorption reaction of cation & anion held on to the surface of solids. **[4]**

Total No. of Questions :8]

SEAT No. :

P2752

[Total No. of Pages :2

[4660]-48
M.E. (Civil) (Hydraulics)
HYDROLOGY
(2008 Course) (Semester - II) (501309)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Explain the meteorological process of precipitation. **[8]**

b) Following are the ordinates of 4 hr unit hydrograph. Derive the ordinates of 12 hr unit hydrograph for the same catchment by using S-curve method. **[8]**

Time (hr)	0	4	8	12	16	20	24	28	32	36	40	44
4-hr UHGO (cumec)	0	18	75	130	155	130	85	60	30	15	5	0

Q2) a) Write a note on time series. **[8]**

b) Enlist various factors affecting infiltration rate and explain any two of them in detail. **[8]**

Q3) a) Explain the use of empirical formulae to estimate flood discharge. **[8]**

b) Explain Gumbel's method of estimation of peak flood. **[8]**

Q4) Write short notes on: **[18]**

a) DAD analysis

b) Flood lift

c) Extreme value theory

P.T.O.

SECTION -II

Q5) a) Write a note on storativity. **[8]**

b) A tube well of 30 cm diameter penetrates fully a confined aquifer. The length of the strainer is 25 m. Calculate the yield from the well under a drawdown of 3 m. The coefficient of permeability of aquifer is 48 m/day. Assume radius of circle of influence to be 200 m. **[8]**

Q6) a) Write a note on ground water quality. **[8]**

b) Write a note on ground water quantamination. **[8]**

Q7) a) Explain 'Basin Method' of artificial recharge of ground water. **[8]**

b) Write a note on ground water budget. **[8]**

Q8) Write short note on: **[18]**

a) Method of images.

b) Development of wells.

c) Types of strainers.

EEE

Total No. of Questions : 8]

SEAT No. :

P3380

[Total No. of Pages :2

[4660]-481

M.E. (Chemical-Environmental)

d-AIR AND NOISE POLLUTION CONTROL

(Elective-I) (Semester-I) (2008 Pattern) (509134)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) Discuss the sources, classification and effects of particulate matters. **[16]**

Q2) Discuss about sampling and monitoring techniques of air pollution. **[16]**

Q3) Explain about the following: **[16]**

a) Dispersion Model.

b) Air pollution laws & Regulations.

Q4) Explain the principle, working of Electrostatic precipitator with figure. **[18]**

SECTION-II

Q5) a) Give the characteristic, sources and effect of Noise pollution. How to control the Noise in Thermal power Plant? **[16]**

P.T.O.

Q6) Explain the method for the removal of Nox with neat figure. **[16]**

Q7) Discuss the air pollution status in India and role of government and action plan to control industrial emissions. **[18]**

Q8) Write a short note on:

a) Effects of Ammonia on Humans. **[8]**

b) Catalytic Converter. **[8]**

□□□□

Total No. of Questions : 8]

SEAT No. :

P2900

[Total No. of Pages :2

[4660] - 482

M.E. (Chemical) (Environmental Engg.) (Semester - I)

MEMBRANE TECHNOLOGY IN ENVIRONMENTAL ENGINEERING

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Maximum Marks :100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain conventional filtration and membrane filtration process. How Membrane separation processes are classified? **[6]**

b) Explain Industrial applications of membrane processes. **[6]**

c) Discuss essential features of membrane process. **[6]**

Q2) a) Explain controlling factors for the selection of polymers for the membrane preparation. **[8]**

b) Explain phase inversion process on a ternary diagram. **[8]**

Q3) a) Explain how performance of a membrane is determined? **[8]**

b) Explain classification of separation processes with suitable examples. **[4]**

c) Explain the use of non porous membranes **[4]**

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

a) Surface properties of membranes.

b) Necessity of modules.

c) Charged membranes.

d) Polymer coating process.

P.T.O.

SECTION - II

Q5) a) Explain Symmetric and Asymmetric membranes. How interfacial polymerization is used for the preparation of composite membrane? **[6]**

b) Explain Sol-Gel Process for inorganic composite membrane. **[6]**

c) Explain dead-end operation and cross flow operation. What is a 'tapered design' of modules in system? **[6]**

Q6) a) Explain how demixing time controls the membrane morphology. **[6]**

b) Define a phase and explain the preparation of glass membrane by phase separation. **[5]**

c) Various methods used for membrane preparation. **[5]**

Q7) a) Explain the crystallization, gelation and vitrification process for the polymer membranes. **[8]**

b) Which are the driving forces are used in membrane processes? Explain with suitable Examples. **[8]**

Q8) Write short notes on the following: **[16]**

a) Osmosis and Reverse Osmosis.

b) Membrane reactors.

c) Liquid membranes.

d) Purification of Sea water.

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Total No. of Questions : 8]

SEAT No. :

P3462

[Total No. of Pages : 2

[4660] - 483

M.E. (Environmental Engineering)

ENVIRONMENTAL AUDITING AND EMS

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

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the objectives of Environmental Audit **[8]**

b) State and explain the concept of Environmental Audit with suitable example **[8]**

Q2) Explain general Environmental Audit methodology and its scope. **[16]**

Q3) a) What are Waste Audits and pollution Prevention Assessment **[8]**

b) What are basic Audit protocol **[8]**

Q4) a) What are the importance of Onsite Audit and state its applicability **[9]**

b) Explain the benifits of Environmental Management System **[9]**

P.T.O.

SECTION - II

Q5) Explain in detail the structure of Audit report with the action plan **[16]**

Q6) a) How the implementation of an Environmental Management System is enacted. **[8]**

b) What are the basic principles of Environmental Management **[8]**

Q7) Explain measurement and evaluations required for an Environmental Management System **[16]**

Q8) Write short note on **[18]**

a) Environmental Management reviews.

b) Legal and regulatory aspects of Environmental Audit.

c) Data Sampling

Total No. of Questions : 8]

SEAT No. :

P3461

[Total No. of Pages : 2

[4660] - 484

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

AGRICULTURAL POLLUTION AND CONTROL

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:-

1) ***Figures to the right indicate full marks.***
2) ***Use of programmable calculator is not allowed.***
3) ***Draw a neat sketch wherever necessary.***
4) ***Make necessary assumptions where required.***
5) ***Answers any Three questions from Section - I and any three questions from Section - II.***

SECTION - I

Q1) Explain in details from the following : **[16]**

a) Root zone treatment

b) Membrane technology

Q2) a) Explain with neat sketch the biotrickling filter for air pollution control with its applications. **[8]**

b) Explain in details about manufacturing of organic fertilizers. **[8]**

Q3) a) Use of bio scrubbers for air pollution control : Explain in details. **[9]**

b) What is the procedure, advantages and disadvantages of bioremediation of soil? **[9]**

P.T.O.

Q4) a) Write notes on recycle and reuse of wastewater for agricultural use considering primary, secondary and tertiary treatment to be given. **[8]**

b) What is water logging? How it can be controlled? Discuss. **[8]**

SECTION - II

Q5) a) Comment on appropriate management plan for curbing agricultural pollution with reference to western Maharashtra. **[9]**

b) Explain in detail use of bio-scrubbers for controlling air pollution from an agro based industry. **[9]**

Q6) a) Agricultural pollution is one of the main sources of pollution of water bodies. Explain in detail. Also explain various methods of curbing this type of pollution. **[8]**

b) Bioremediation is a better mode of treatment for agricultural pollution. Comment on this statement. **[8]**

Q7) Write short note on : **[16]**

a) Agro meteorology

b) Recycle and Reuse of Agricultural Waste

Q8) a) Draw and explain treatment flow sheet for dairy waste. **[8]**

b) Explain various soil conservation techniques. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3381

[Total No. of Pages : 2

[4660]-485

M.E. (Environmental Engineering) (BOS - Chemical)

d - ENVIRONMENTAL IMPACT ASSESSMENT & ECONOMICS

(Elective - II) (Semester - I) (2008 Pattern) (509135)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt Any Six questions.***
2) ***Figures to the right side indicate full marks.***
3) ***Illustrate your answers with suitable examples and diagrams, wherever necessary.***
4) ***Write relevant question number before writing the answer.***

Q1) a) What are the aims and objective of getting Environmental Impact Assessment done before start of any project? **[8]**

b) Discuss in details about the mitigation process involved in EIA studies. **[8]**

Q2) a) What is importance of public participation in environment decision making? Discuss with suitable example. **[8]**

b) Discuss the economics involved of pollution control. What are the important factors which governs this economics? **[8]**

Q3) a) How the biological impacts are assessed? How it helps in doing the predictions of the same? Discuss the impacts of thermal power plants on to the ecology. **[10]**

b) Discuss the details of environmental impact of mining and atomic power stations. **[8]**

Q4) a) Discuss the economic operations concern with different environemtnal issues. How adversities on economics are observed? **[8]**

b) Discuss the environmental assets, imcomplete markets and externalities in details. **[8]**

P.T.O.

Q5) a) Discuss the non-convexities and asymmetric information in details. **[8]**

b) What do you mean by price rationing? What are the charges and subsidies are involved in it? Discuss with example. **[10]**

Q6) a) Discuss in details about the practical conditions for use of economic incentives. **[8]**

b) Elaborate on Pollution taxes. What do you mean by efficiency properties of a tax on emissions? **[8]**

Q7) a) What are the problems with pollution taxes? **[8]**

b) Discuss the basic theory of tradable pollution permits. **[8]**

Q8) a) Write in details about international organizations for environmental protection and their roles and responsibilities. **[8]**

b) Discuss in details about the current national and international scenario on agrochemical based pollution. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3382

[Total No. of Pages : 2

[4660]-487
M.E. (Chemical) (Environmental Engineering)
SOLID WASTE MANAGEMENT
(509139) (2008 Course) (Semester-II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) What are the objectives of solid waste management and discuss the functional elements of solid waste management. **[8]**

b) Explain the environmental impact of mismanagement of solid waste. **[8]**

Q2) a) What are the means and methods for transportation of solid waste? **[8]**

b) Discuss the factors affecting on storage and collection of Solid waste. **[8]**

Q3) Discuss the following in details: **[18]**

a) Economic Analysis of solid waste Management.

b) Guidelines for sorting of material and recovery.

Q4) Explain the principle, construction and design details of the following with neat diagrams: **[16]**

a) Pyrolysis.

b) Energy recovery from solid waste.

P.T.O.

SECTION-II

Q5) a) Define landfill. What are the types of landfills? Explain the Site selection and essential Components of landfilling. **[10]**

b) Discuss the modified landfill design for sustainable waste management. **[6]**

Q6) What are the various elements of financial management plan for solid waste system. **[16]**

Q7) a) For solid waste disposal site, the avg.-speed data obtained is given in following table. Find the haul speed constants "a" and "b" and the total time for site located at 35 km away. **[12]**

Distance X, km/trip	10	20	30	40	50	60
Avg. Haul speed, Y, km/hr	15	20	25	30	35	40
Total Time, hr.	0.67	1	1.2	1.34	1.42	1.5

b) Give the expression for the Hauled Container System. **[6]**

Q8) Write notes on: **[16]**

a) Present Indian Scenario of solid waste management.

b) Fluidized bed combustion.

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Total No. of Questions : 8]

SEAT No. :

P2901

[Total No. of Pages :2

[4660] - 488

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

INDUSTRIAL WASTE TREATMENT

(2008 Pattern)

Time : 3 Hours] *[Maximum Marks :100*

Instructions to the candidates:

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

SECTION - I

Q1) Explain the treatment techniques for removal of the following pollutants from Industrial waste:

a) Heavy Metal. **[6]**

b) Oil and Grease. **[6]**

c) Calcium. **[6]**

Q2) a) Write short notes Trickling Filters. **[8]**

b) Explain Advanced treatments for industrial wastewater. **[8]**

Q3) What are clean up and cleaner technologies? Explain with proper examples.**[16]**

Q4) Explain the treatment techniques for the removal of Oil & Grease from industrial wastewater with neat flow diagram. **[18]**

P.T.O.

SECTION - II

Q5) Draw the flow sheet for treatment of sugar waste and focus on its cost benefit analysis with all details. **[18]**

Q6) Define BOD. Explain the procedure to determine BOD. What are the limitations of BOD Test. **[16]**

Q7) Explain the concept, objective, design and cost - benefit analysis of common effluent treatment plant. **[16]**

Q8) Write notes on:

a) Flow chart for sludge treatment and disposal. **[8]**

b) Oxidation Pond. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P3383

[Total No. of Pages : 2

[4660]-489

M.E. (Environmental Engineering) (BOS - Chemical Eng.)

ECOLOGY AND RISK ASSESSMENT

(Elective - III) (Semester - II) (2008 Pattern) (509141)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt Any Six questions.***
2) ***Figures to the right side indicate full marks.***
3) ***Illustrate your answers with suitable examples and diagrams, wherever necessary.***
4) ***Write relevant question number before writing the answer.***

Q1) a) What are the important factors of Eco-systems? How they help in keeping the environment balanced? **[8]**

b) How energy in Eco-system is recycled in various forms? **[8]**

Q2) a) Discuss in details about the Biogeochemical cycles. What is importance of these cycles. **[8]**

b) Discuss the principles pertaining to limiting factors. **[8]**

Q3) a) Explain the principles and concepts at the community and population levels. **[10]**

b) Elaborate in details on species in eco-systems. **[8]**

Q4) a) Discuss the Devolution and Evolution of eco system. **[8]**

b) Explain various models of ecology which are in existence. **[8]**

Q5) a) What do you understand by fresh water ecology? **[8]**

b) Discuss the Marine ecology and Estuarine ecology? **[10]**

P.T.O.

Q6) a) Discuss the importance of various ecology in sustainable development and biodiversity. **[8]**

b) How the damage assessment is done for the ecology? **[8]**

Q7) a) How the quantification of uncertainty is done? **[8]**

b) What do you mean by predictive risk assessment? **[8]**

Q8) a) Discuss the impact of exposure for ecology. **[8]**

b) Discuss the various man made activities which creates the imbalance in to the ecology and its impact on to the nature. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3438

[Total No. of Pages : 2

[4660]-49
M.E. (Civil) (Hydraulics)
SEDIMENT TRANSPORT AND RIVER MECHANICS
(2008 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Solve any Three questions from Each Section.***
2) ***Figures to the right indicate full marks.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the significant sediment properties? Explain approach of Sediment motion and also explain shied analysis for sediment motion in detail. **[10]**

b) How the form resistance and grain resistance vary in different flow regimes? **[8]**

Q2) a) Explain the various flow regimes considering changes in flow conditions with sketches. **[10]**

b) What do you mean by bed load, contact load and wash load? Distinguish between bed load and contact load. **[6]**

Q3) a) Use Meyer-Peter and Muller equation for bed load transport of sediment in an alluvium channel with following data: **[10]**

i) width = 120m

ii) discharge = $300 m^3/s$

iii) depth of water = 4m

iv) bed slope of channel = 1 in 4000

v) mean size of sediment particle = 3mm

b) How significantly the remote sensing method is used in finding out the rate sediment transport? **[6]**

P.T.O.

Q4) a) Explain Dubuoy's bed load equation for prediction of bed load transport rate. **[10]**

b) Water flows at a depth of 0.500 m in a wide rectangular channel with bed slope 1 in 1200. The average diameter of sand grain in the channel bed is 1 mm. Comment on whether the grains are stationary or in motion. **[6]**

SECTION - II

Q5) a) Compare Kennedy method and Lacey method for the design of an irrigation channel Also Design an irrigation channel in alluvial soil according to Lacey's method for following data: **[12]**

i) Full supply discharge: 40 m^3/sec

ii) Lacey's silt factor – 0.9

iii) Channel side slope 0.5H : 1 V

b) Explain in detail Tractive force approach for stable channel design. **[6]**

Q6) a) Explain microscopic and macroscopic methods for bed load measurements and suspended load measurements. **[8]**

b) Explain the various for controlling the sedimentation of reservoirs. Also mention the effectiveness of each measure for sediment control. **[8]**

Q7) a) What is river gauging? Explain the methods of river gauging in detail. **[8]**

b) In context with river morphology explain the terms bifurcation sand confluences. **[8]**

Q8) a) Explain the types of classification of river training works. **[8]**

b) Write short notes on – **[8]**

i) Delta formations

ii) Meandering of rivers

Total No. of Questions : 8]

SEAT No. :

P3384

[Total No. of Pages : 1

[4660]-490

M.E. (Chemical)

b - WATER QUALITY MODELING

(509141) (2008 Pattern) (Elective - III) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What is modeling?

b) Explain various steps involved in model building. **[16]**

Q2) What is low frequency analysis? Explain in detail. **[16]**

Q3) What are the point and non point sources of pollution? Explain. **[16]**

Q4) What are the limitations of mathematical model? Explain with suitable example. **[18]**

SECTION - II

Q5) a) Discuss hierarchy of water resource scheme.

b) What is model validation? **[16]**

Q6) Develop a model for a transport of pollutant resulting from flow of water. **[16]**

Q7) Write notes on: **[16]**

a) Ideal plug flow reactor.

b) Non ideal plug flow reactor.

Q8) What is steady state prediction model? Explain with suitable example. **[18]**

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Total No. of Questions : 8]

SEAT No. :

P3452

[Total No. of Pages : 2

[4660]-492
M.E. (Environmental Engineering)
ENVIRONMENTAL BIOTECHNOLOGY
(2008 Pattern) (Semester - II) (Elective - III)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Figures to the right indicate full marks.***
2) ***Use of programmable calculator is not allowed.***
3) ***Draw a neat sketch wherever necessary.***
4) ***Make necessary assumptions where required.***
5) ***Answers anyThree questions from section–I and any three Questions from Section–II.***

SECTION - I

Q1) Discuss in details from the following: **[16]**

a) Activated sludge process

b) Trickling filters

Q2) a) Define Environmental Biotechnology and explain its scope in details. **[8]**

b) What does Industrial Microbiology mean? Give its importance. **[8]**

Q3) a) Explain in details the treatment process for dairy waste water. **[8]**

b) What is the procedure, advantages and disadvantages of aerobic processes? **[8]**

Q4) What are the different types of bioremediations? Explain in details any two. **[18]**

P.T.O.

SECTION - II

Q5) Comment in details on: **[16]**

a) Root zone treatment

b) Membrane technology

Q6) a) Explain any two processes of anaerobic digestion. **[8]**

b) Bioremediation is a better mode of treatment for pesticides and herbicides pollution. Comment on this statement. **[8]**

Q7) Write short note on: **[16]**

a) Biotechnology in reduction of CO_2.

b) Bioaugmentation for bioremediation.

Q8) a) Draw and explain treatment flow sheet for sugar and antibiotic industry. **[9]**

b) State and explain any one bioscrubbers techniques of air pollution control. **[9]**

Total No. of Questions : 8]

SEAT No. :

P3468

[Total No. of Pages :3

[4660] -493

M.E. (Chemical) (Environmental Engg.)

GROUND WATER CONTAMINATION & POLLUTION TRANSPORT

(2008 Pattern) (Semester - II)

Time : 3 Hours] *[Maximum Marks :100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What is hydrochemical characteristics of groundwater? Explain hydrochemical classification of ground water. **[6]**

b) Explain groundwater contamination and what are the different potential sources of groundwater contamination, explain any two. **[6]**

c) Explain the different aquifer characteristics that aid movement of pollutants into groundwater table. **[6]**

Q2) a) What is hydrologic cycle & how does it differ from groundwater cycle? **[6]**

b) What are the factors which affect the darcian velocity for flow through soil? What are range of validity of darcy law? **[4]**

c) An open well pumps out $30m^3$ of water when pumped for 3hours, resulting in fall of water level from 4.5m to 5.75m when pumping stopped. Recovery observed for 3hours is as below. If the size of well is $36m^2$, determine,

i) Seepage rate into well,

ii) Specific yield of soil,

P.T.O.

iii) Specific yield of well and

iv) Discharge of well under a safe depression head of 0.75m. **[6]**

Time since Pump stopped mnt	Recovery
0	5.75
30	5.40
60	5.15
90	4.90
120	4.75
150	4.65
180	4.55
210	4.50

Q3) a) What are the characteristics of Regional Ground water flow system? Explain symmetry of flow system. **[4]**

b) Develop one dimensional groundwater flow equation **[6]**

c) Show that the changes in effective stress in a saturated aquifer depends on change in hydraulic head at that point **[6]**

Q4) a) What are different types of aquifers? What are the different aquifer parameter used for groundwater studies? Explain any 2 parameters. **[6]**

b) Explain how volume of ground water discharge can be measured by flownet analysis. What are the different methods of constructing flownet. **[6]**

c) Explain hydrologic budget and give generalised hydraulic budget equation for any region. **[4]**

SECTION - II

Q5) a) Explain the process of solute migration through aquifer by

i) Advection &

ii) Hydrodynamic dispersion **[6]**

b) Explain underground travel phenomenon of ground water contamination. **[6]**

c) What are fractured rock system? Explain the utility of predicting the rate and direction of contaminant flow in fractured rock. **[6]**

Q6) a) What are the source of urban solid waste generation and give a brief account of composition of urban solid waste. **[6]**

b) Discuss the disadvantage of detecting ground water table and what are the factors which are responsible for fall in groundwater table. **[6]**

c) What are karstic landform? How are they developed. **[4]**

Q7) a) What are the factors resulting in sea water intrusion? **[4]**

b) Explain the viscous model studies for salt water intrusion in coastal aquifer. **[8]**

c) What are trace metals and how do they contribute for ground water contamination. **[4]**

Q8) a) Explain tracer test for dispersion groundwater contamination. **[4]**

b) Answer any 3 of the following **[12]**

i) Water quality plot and maps.

ii) Leaching efficiency and leaching fraction

iii) Any one method of control of sea water intrusion

iv) Dispersion and Retardation of contaminant into ground water.

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Total No. of Questions : 8]

SEAT No. :

P3431

[Total No. of Pages : 2

[4660] - 496

M.E. (Petroleum Engineering)

Horizontal, Multilateral and Intelligent Wells

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate books.***
2) ***Q 1 and Q 5 are compulsory. Write any other two questions each from section I and II.***
3) ***Use of graph paper is allowed.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss casing Buckling theory considering effect of temperature, pressure and mud weight. **[10]**

b) How abnormal pressure calculation is carried out using D exponent and Sonic log. **[8]**

Q2)

Hole Size	Casing Size	Depth. m BRT	Pore Pressure, ppg	Mud Weight, ppg	Expected Fracture Gradient at shoe, ppg
26"	20"	0 – 450	9.1	9.5	12.5
17.1/2"	13.3/8"	0 – 1,150	9.2	9.5 – 9.8	15.1
12.1/4"	9.5/8"	0 – 1,990	9.4	9.8 – 10.0	16.8
8.1/2"	7" Liner	1,740 – 2,806	10.8	10.0 – 11.4	15.5

Using above data calculate Kick tolerance an MAASP for 17.1/2" Hole. Explain Kick tolerance. **[16]**

P.T.O.

Q3) a) Explain 'L' type directional well geometry in detail. **[8]**

b) Describe positive displacement motor and MWD tool with suitable sketch. **[8]**

Q4) Write short note on **any two** of the following. **[16]**

a) Minimum curvature method

b) Multilateral wells

c) Side-tracking technique

SECTION - II

Q5) a) Discuss weight and wait method of well control in detail. **[10]**

b) SIDPP = 300 Psi, SICP = 200 Psi, Mud weight 10.2 ppg **[8]**

Depth 10450 ft MD/ 10,000 ft TVD

Calculate ICP, FCP, Kill mud weight.

Q6) a) Draw drilling rig Mud circulation system and discuss pressure losses in the system. **[10]**

b) What is optimum hydraulics? Discuss Impact force, BHHP, HSI. **[6]**

Q7) a) Describe two stage cementation in detail. **[8]**

b) Write in brief about "Drilling fluid and cement slurry design for HPHT wells". **[8]**

Q8) Write short note on **any two** of the following : **[16]**

a) Intelligent well completion

b) LWD

c) Economics of complex wells

Total No. of Questions : 10]

SEAT No. :

P3385

[Total No. of Pages : 2

[4660]-499

M.E. (Petroleum)

c - OIL AND GAS FIELD DEVELOPMENT

(Elective - I) (512104) (2008 Course) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) What do you mean by oil and gas field development? Discuss in detail different stages involved in the process of oil field development? **[18]**

Q2) Write the different types of reservoir dive mechanisms explain their features, such as GOR, IPR, PI and pressure variation with time. Show them graphically. Also define and explain any for PVT properties. **[16]**

Q3) Classify different types of artificial lift techniques and write the working principle of any four in brief. **[16]**

Q4) a) What is skin factor? How do you understand formation damage problem for a wellbore? Discuss general methods to overcome formation damage problem for a wellbore. **[8]**

b) Discuss usability of Jet pump, PCP and SRP in terms of excellent/good/fair/poor in a tabular form for following well conditions such as : Low PI, adaptability to deviated wells, capability to produce sand, and depth limits. **[8]**

P.T.O.

Q5) Draw process typical flow diagram and discuss various stages, their components and general working for a typical GGS and CTF in detail. **[16]**

SECTION - II

Q6) Explain general procedure and steps involved in reservoir simulation and modeling? How it is different than analytical modeling? Write advantages and applications of reservoir modeling and simulation in field development along with one example? **[18]**

Q7) a) Discuss in detail secondary recovery or pressure maintenance. **[8]**

b) Why and when is it necessary to go for tertiary recovery or enhanced oil recovery from a reservoir? Discuss in brief basic principle of operation of different methods of enhanced oil recovery. **[8]**

Q8) a) Describe the following in brief: **[12]**

i) Sand control.

ii) Paraffin deposition.

iii) Environmental challenges in offshore field development.

iv) Scale deposition.

b) Discuss Marginal fields and their development program in brief. **[4]**

Q9) Discuss in detail design consideration for onshore and offshore pipe line transportation of oil and gas. **[16]**

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

a) Horizontal well technology.

b) Deep water drilling.

c) Estimation of oil and gas in place.

d) Multilateral drilling technology.

Total No. of Questions :6]

SEAT No. :

P2753

[Total No. of Pages :2

[4660]-50
M.E. (Civil) (Hydraulics)
a - IRRIGATION & DRAINAGE
(2008 Course) (Elective III) (Semester - II) (501311)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) A moist soil sample has a volume of 484 cm^3 in the natural state and a weight of 7.94N. The dry weight of the soil is 7.36 N and the relative density of the soil particles is 2.65. Determine the porosity, soil moisture content, volumetric moisture content, and degree of saturation. **[7]**

b) For the following data pertaining to a cultivated land, determine irrigation interval and amount of irrigation water needed at each irrigation so that the moisture content at any stage does not fall below 40 per cent of the maximum available moistures. **[10]**

Field capacity of soil = 35%

Permanent wilting point =12%

Porosity of soil = 0.42

Depth of root-zone soil = 1.20 m

Consumptive use = 12 mm per day

Application efficiency = 60%

c) Explain in detail how soil properties affect the irrigation requirement. **[8]**

Q2) a) The consumptive use for a given crop is 90 mm. Determine the field irrigation requirement if the effective rainfall and the irrigation efficiency in the area are 15 mm and 60 per cent, respectively. **[7]**

P.T.O.

b) Write with neat diagrams about: **[10]**

i) Terraces ii) Bunds iii) Trenches iv) Gabion structures

c) List out different methods of measuring evaporation. Explain any one in detail. **[8]**

Q3) a) Describe the USLE method for Soil Loss Estimation. **[8]**

b) State the different methods of soil conservation. Explain any one in detail. **[7]**

c) What are the effects of irrigation soil management on soil salinity and alkalinity? **[10]**

SECTION -II

Q4) a) Explain With neat sketch design concept of jack well distribution system. **[10]**

b) Write short note on general concepts and elements of lift irrigation schemes. **[7]**

c) State the advantages & disadvantages of Drip irrigation system. Explain the concept of design of it. **[8]**

Q5) a) Write about the reasons for water logging and the ways for reclamation of water logged lands. **[10]**

b) Describe Kennedy's gauge outlet with diagram. **[7]**

c) Explain GCA, CCA, equitable water distribution system. **[8]**

Q6) a) Enlist the various canals out lets. Explain any one in detail. **[7]**

b) The culturable command area for a distributary channel is 10,000 hectares. The intensity of irrigation is 30 per cent for wheat and 15 per cent for rice. The *kor* period for wheat is 4 weeks, and for rice 3 weeks. Kor watering depths for wheat and rice are 135 mm and 190 mm, respectively. Estimate the outlet discharge. **[8]**

c) Closed drains at a spacing of 16 m are located 2 m below the ground surface and the position of the water table is 1.7 m below the ground surface. Find the discharge carried by a drain if the coefficient of permeability of the soil is 2×10^{-2} cm/s and the depth of the pervious stratum is 8 m. **[10]**

ℰ ℰ ℰ

Total No. of Questions : 8]

SEAT No. :

P3386

[Total No. of Pages : 4

[4660]-503

M.E. (Petroleum Engineering)

c - WELL TESTING AND ANALYSIS

(512105) (2008 Pattern) (Elective - II) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Questions No. 2(two) and 8(eight) are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
5) ***Neat diagrams should be drawn wherever necessary.***
6) ***Use of a non-programmable calculator, log-log, and semi-log paper is allowed.***
7) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Which all laws are used in the derivation of the diffusivity equation? Explain in detail, with appropriate equations. **[6]**

b) Explain the various flow regimes that are witnessed in a horizontal well test, along with neat diagrams. **[10]**

Q2) Following data is given

$q = 30$ stb/d

$h = 140$ ft

$B = 1.47$ RB/STB

$k = 0.2$ md

$c_t = 1.4 \times 10^{-5}$ psi^{-1}

$\mu = 0.72$ cp

$r_w = 0.5$ ft

$P_i = 3100$ psi

porosity = 20%

$r_e = 2800$ ft

Calculate the reservoir pressure at the radius of 1 ft, 5 ft, 10 ft and 50 ft after 3 hours of oil production. **[18]**

P.T.O.

Q3) a) What is meant by transient, pseudo-steady state and steady state flow regimes? **[4]**

b) Explain Superposition in space in detail, with appropriate diagrams. **[4]**

c) 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 : B_o = 1.25 rb/stb, h = 20 ft, phi = 0.20, r_w = 0.29 ft, ct = 19.5 × 10^–6, and viscosity = 1.1 cP. From these data estimate the formation permeability, k, pi, and skin factor s. Use the Semi-Log graph. **[8]**

Shut-in time, Del-t(hr)	(tp + Del-t)/Del-t	p_{ws}(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

Q4) a) Give at least 5 main differences between DST and PBU and DD test.**[6]**

b) Explain the phenomenon of afterflow and unloading, along with appropriate diagrams. **[10]**

SECTION - II

Q5) a) Why and how is gas well testing different than oil well testing?

b) How is an Isochronal test different from a Modified Isochronal Well test.

[16]

Q6) What are the different types of empirical decline curves? Explain with sketches. **[16]**

Q7) What are the assumptions used for the derivation of continuity equation? Mention the types of possible solutions of the diffusivity equation. **[16]**

Q8) Define and explain the pressure derivative plot. Draw and explain the diagnostic plot giving five examples. **[18]**

Formulas for the exam

For E (i) function values, refer to the table given with the examination paper

$$p = p_i + 70.6\frac{qB\mu}{kh}\text{Ei}\left(-\frac{948\phi\mu c_t r^2}{kt}\right)$$

$$t_D = \frac{0.000264kt}{\phi\mu_o c_t r_w^2}$$

$$p_{ws} = p_i - \frac{162.6\, q_o\, \mu_o\, \beta_o}{kh}\log\left[\frac{t_p + \Delta t}{\Delta t}\right]$$

$$p_D = -\frac{1}{2}Ei\left(-\frac{r_D^2}{4t_D}\right)$$

$$s = 1.151\left[\frac{p_{1\,hr} - p_{ws(\Delta t=0)}}{m} - \log\left(\frac{k}{\phi\mu_o c_t r_w^2}\right) + 3.23\right]$$

$$p_{wf} = p_i - \frac{162.6 q_o \mu_o \beta_o}{kh}\left[\log t + \log\left(\frac{k}{\phi\mu_o c_t r_w^2}\right) - 3.23 + 0.869s\right]$$

$$p = p_i + 70.6\frac{qB\mu}{kh}\left[\ln\left(\frac{1,688\phi\mu c_t r^2}{kt}\right)\right]$$

$$\frac{(3.975 \times 10^5)\phi\mu c_t r_w^2}{k} < t < \frac{948\phi\mu c_t r_e^2}{k}$$

$$p_{1h} = p_i + m\left[\log\left(\frac{k}{\phi\mu_o\beta_o c_t r_w^2}\right) - 3.23 + 0.869s\right]$$

$$p(r,t) = LS(r,t) = p_i - \frac{70.6\, Q\, \mu}{k\, h}\left[-E_i\left(-\frac{948.1\,\Phi\,\mu\, c_t\, r^2}{k\, t}\right)\right]$$

$$k = \frac{162.6\, q_o\, \mu_o\, \beta_o}{mh}$$

TABLE 1.1—VALUES OF THE EXPONENTIAL INTEGRAL, $-Ei(-x)$

$-Ei(-x)$, $0.000 < x < 0.209$, interval = 0.001

x	0	1	2	3	4	5	6	7	8	9
0.00	$+\infty$	6.332	5.639	5.235	4.948	4.726	4.545	4.392	4.259	4.142
0.01	4.038	3.944	3.858	3.779	3.705	3.637	3.574	3.514	3.458	3.405
0.02	3.355	3.307	3.261	3.218	3.176	3.137	3.098	3.062	3.026	2.992
0.03	2.959	2.927	2.897	2.867	2.838	2.810	2.783	2.756	2.731	2.706
0.04	2.681	2.658	2.634	2.612	2.590	2.568	2.547	2.527	2.507	2.487
0.05	2.468	2.449	2.431	2.413	2.395	2.377	2.360	2.344	2.327	2.311
0.06	2.295	2.279	2.264	2.249	2.235	2.220	2.206	2.192	2.178	2.164
0.07	2.151	2.138	2.125	2.112	2.099	2.087	2.074	2.062	2.050	2.039
0.08	2.027	2.015	2.004	1.993	1.982	1.971	1.960	1.950	1.939	1.929
0.09	1.919	1.909	1.899	1.889	1.879	1.869	1.860	1.850	1.841	1.832
0.10	1.823	1.814	1.805	1.796	1.788	1.779	1.770	1.762	1.754	1.745
0.11	1.737	1.729	1.721	1.713	1.705	1.697	1.689	1.682	1.674	1.667
0.12	1.660	1.652	1.645	1.638	1.631	1.623	1.616	1.609	1.603	1.596
0.13	1.589	1.582	1.576	1.569	1.562	1.556	1.549	1.543	1.537	1.530
0.14	1.524	1.518	1.512	1.506	1.500	1.494	1.488	1.482	1.476	1.470
0.15	1.464	1.459	1.453	1.447	1.442	1.436	1.431	1.425	1.420	1.415
0.16	1.409	1.404	1.399	1.393	1.388	1.383	1.378	1.373	1.368	1.363
0.17	1.358	1.353	1.348	1.343	1.338	1.333	1.329	1.324	1.319	1.314
0.18	1.310	1.305	1.301	1.296	1.291	1.287	1.282	1.278	1.274	1.269
0.19	1.265	1.261	1.256	1.252	1.248	1.243	1.239	1.235	1.231	1.227
0.20	1.223	1.219	1.215	1.210	1.206	1.202	1.198	1.195	1.191	1.187

$-Ei(-x)$, $0.00 < x < 2.09$, interval = 0.01

x	0	1	2	3	4	5	6	7	8	9
0.0	$+\infty$	4.038	3.335	2.959	2.681	2.468	2.295	2.151	2.027	1.919
0.1	1.823	1.737	1.660	1.589	1.524	1.464	1.409	1.358	1.309	1.265
0.2	1.223	1.183	1.145	1.110	1.076	1.044	1.014	0.985	0.957	0.931
0.3	0.906	0.882	0.858	0.836	0.815	0.794	0.774	0.755	0.737	0.719
0.4	0.702	0.686	0.670	0.655	0.640	0.625	0.611	0.598	0.585	0.572
0.5	0.560	0.548	0.536	0.525	0.514	0.503	0.493	0.483	0.473	0.464
0.6	0.454	0.445	0.437	0.428	0.420	0.412	0.404	0.396	0.388	0.381
0.7	0.374	0.367	0.360	0.353	0.347	0.340	0.334	0.328	0.322	0.316
0.8	0.311	0.305	0.300	0.295	0.289	0.284	0.279	0.274	0.269	0.265
0.9	0.260	0.256	0.251	0.247	0.243	0.239	0.235	0.231	0.227	0.223
1.0	0.219	0.216	0.212	0.209	0.205	0.202	0.198	0.195	0.192	0.189
1.1	0.186	0.183	0.180	0.177	0.174	0.172	0.169	0.166	0.164	0.161
1.2	0.158	0.156	0.153	0.151	0.149	0.146	0.144	0.142	0.140	0.138
1.3	0.135	0.133	0.131	0.129	0.127	0.125	0.124	0.122	0.120	0.118
1.4	0.116	0.114	0.113	0.111	0.109	0.108	0.106	0.105	0.103	0.102
1.5	0.100	0.0985	0.0971	0.0957	0.0943	0.0929	0.0915	0.0902	0.0889	0.0876
1.6	0.0863	0.0851	0.0838	0.0826	0.0814	0.0802	0.0791	0.0780	0.0768	0.0757
1.7	0.0747	0.0736	0.0725	0.0715	0.0705	0.0695	0.0685	0.0675	0.0666	0.0656
1.8	0.0647	0.0638	0.0629	0.0620	0.0612	0.0603	0.0595	0.0586	0.0578	0.0570
1.9	0.0562	0.0554	0.0546	0.0539	0.0531	0.0524	0.0517	0.0510	0.0503	0.0496
2.0	0.0489	0.0482	0.0476	0.0469	0.0463	0.0456	0.0450	0.0444	0.0438	0.0432

$-Ei(-x)$, $2.0 < x < 10.9$, interval = 0.1

x	0	1	2	3	4	5	6	7	8	9
2	4.89×10^{-2}	4.26×10^{-2}	3.72×10^{-2}	3.25×10^{-2}	2.84×10^{-2}	2.49×10^{-2}	2.19×10^{-2}	1.92×10^{-2}	1.69×10^{-2}	1.48×10^{-2}
3	1.30×10^{-2}	1.15×10^{-2}	1.01×10^{-2}	8.94×10^{-3}	7.89×10^{-3}	6.87×10^{-3}	6.16×10^{-3}	5.45×10^{-3}	4.82×10^{-3}	4.27×10^{-3}
4	3.78×10^{-3}	3.35×10^{-3}	2.97×10^{-3}	2.64×10^{-3}	2.34×10^{-3}	2.07×10^{-3}	1.84×10^{-3}	1.64×10^{-3}	1.45×10^{-3}	1.29×10^{-3}
5	1.15×10^{-3}	1.02×10^{-3}	9.08×10^{-4}	8.09×10^{-4}	7.19×10^{-4}	6.41×10^{-4}	5.71×10^{-4}	5.09×10^{-4}	4.53×10^{-4}	4.04×10^{-4}
6	3.60×10^{-4}	3.21×10^{-4}	2.86×10^{-4}	2.55×10^{-4}	2.28×10^{-4}	2.03×10^{-4}	1.82×10^{-4}	1.62×10^{-4}	1.45×10^{-4}	1.29×10^{-4}
7	1.15×10^{-4}	1.03×10^{-4}	9.22×10^{-5}	8.24×10^{-5}	7.36×10^{-5}	6.58×10^{-5}	5.89×10^{-5}	5.26×10^{-5}	4.71×10^{-5}	4.21×10^{-5}
8	3.77×10^{-5}	3.37×10^{-5}	3.02×10^{-5}	2.70×10^{-5}	2.42×10^{-5}	2.16×10^{-5}	1.94×10^{-5}	1.73×10^{-5}	1.55×10^{-5}	1.39×10^{-5}
9	1.24×10^{-5}	1.11×10^{-5}	9.99×10^{-6}	8.95×10^{-6}	8.02×10^{-6}	7.18×10^{-6}	6.44×10^{-6}	5.77×10^{-6}	5.17×10^{-6}	4.64×10^{-6}
10	4.15×10^{-6}	3.73×10^{-6}	3.34×10^{-6}	3.00×10^{-6}	2.68×10^{-6}	2.41×10^{-6}	2.16×10^{-6}	1.94×10^{-6}	1.74×10^{-6}	1.56×10^{-6}

Total No. of Questions : 8]

SEAT No. :

P2903

[Total No. of Pages : 4

[4660] - 505

M.E. (PETROLEUM ENGG.)

GIS and Computer Applications in Petroleum Industry

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate answer books.*
2) *Attempt any two questions each from Section I and from Section II.*
3) *Assume additional data if required.*
4) *Use of graph paper is allowed.*

SECTION-I

Q1) a) Raster and vector have developed as two partially independent traditions in GIS. Summarize the dimensions of the raster-vector debate, particularly in the importance of spatial objects in the two systems. **[15]**

b) You are given data in a matrix of 8 × 8. Consider this as representation of shape of different objects, which needs to be converted into a quad tree diagram. Decompose this into maximal blocks following the concept of Morton order and into a tree structure. **[10]**

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	0	1	1	1	0	0	0	0
2	1	0	1	0	0	1	1	0
3	1	1	0	1	1	1	0	0
4	1	0	1	0	1	0	0	0
5	0	0	1	1	0	1	0	1
6	0	1	1	0	1	0	1	1
7	0	1	0	0	0	1	0	1
8	0	0	0	0	1	1	1	0

P.T.O.

OR

Q2) a) What makes the concept of a spatial database unique relative to other types of databases? List and define an example of a spatial object type from each of the 0-D, 1-D, 2-D and 3-D groups of object types. **[15]**

b) Define the three standard properties of map projections: equal-area, equidistant and conformal. Discuss the relative importance of each for different applications. **[10]**

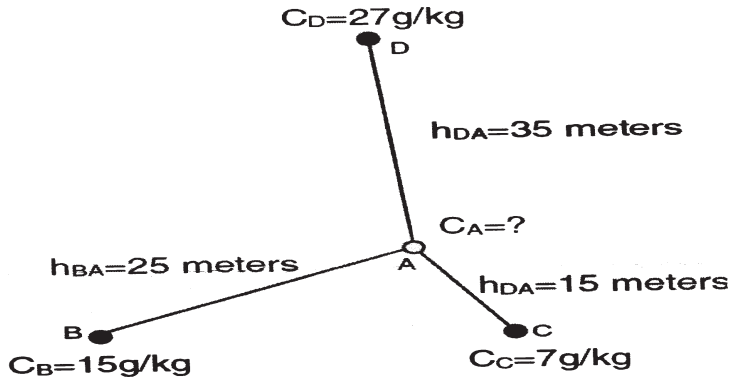
Q3) a) What are buffers/ Dilation? Explain in brief basic methods of determining buffer distances. **[15]**

b) What are multivariate maps? **[10]**

OR

Q4) a) Explain in brief use of Geostatistics in GIS. **[15]**

b) Figure shown below gives contamination concentration values at B, C and D along with distance between them. **[10]**



Calculate the contaminant concentration at point A. How is autocorrelation attempted in such cases?

SECTION - II

Q5) A terminal for the storage of oil is under consideration outside a metro city. The site must be located so that all conditions mentioned below are fulfilled:**[25]**

a) Be in an area where unconsolidated superficial material has minimum thickness.

b) Permeability of foundation material (bedrock) is low, preventing contamination below the surface,

c) Slope is gentle where river flooding is unlikely,

d) Bedrock is not fractured,

e) It should be located in the agricultural zoning outside the limit of metro city and near to the industry, it should not be a prime land,

f) The site should have excellent transportation facility,

g) There are certainly other factors like cost of land and size of the land (Approximately 2 km^2), which should be taken into consideration.

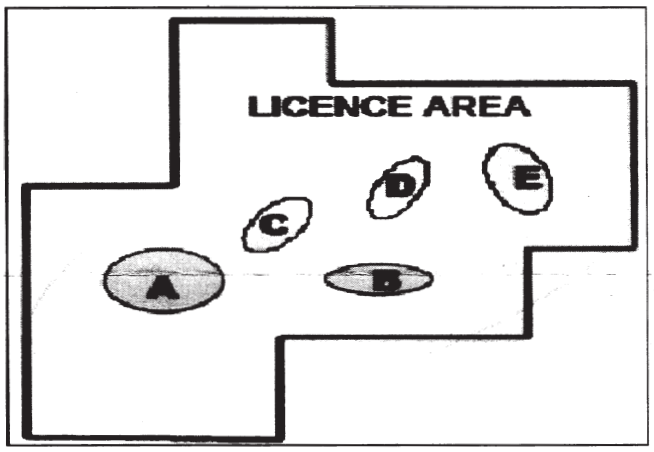
Develop a stepwise procedure starting with the types of maps required. How will you create a suitability map by using the above conditions for the selection of this site?

OR

Q6) a) What is Spatio-temporal data model in GIS? Explain in brief main concepts defined for a space-time path. **[15]**

b) How does Structured Query Language help in the creation of maps based on selective attribute data? What are the major types of SQL? **[10]**

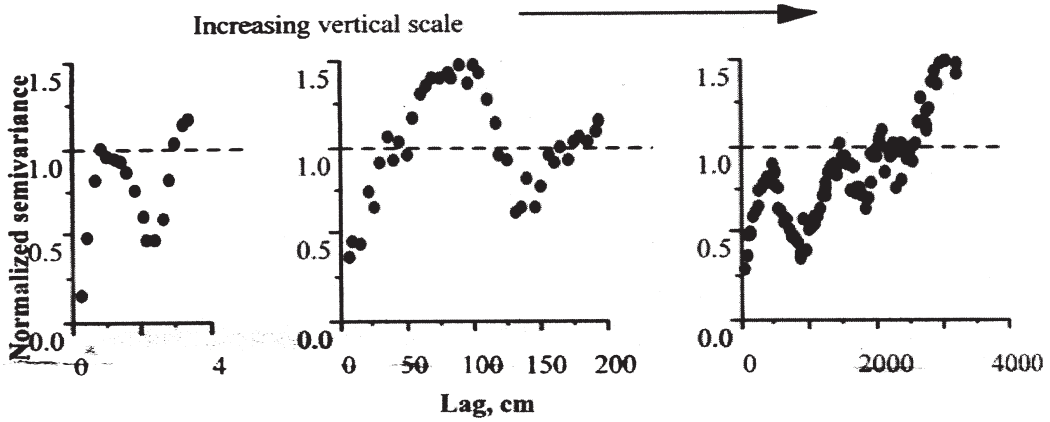
Q7) a) Figure given below shows presence of many plays in a license area controlled by dependent and independent parameters to decide the value of reservoir. Design a template for the creation of a 3D Reservoir model taking into consideration the foresaid dependent and independent parameters. Also list out information on attributes to be included in the DBMS, which would allow a means to review the reservoir model and update the same. **[15]**



b) Explain the procedure to develop Digital Elevation Model. **[10]**

OR

Q8) a) Interpret the following semi-variograms for nugget effect, sill, range and anisotropy. **[15]**



What may be the reason for similar and repetitive patterns on different scales? How nugget effect is explained on different scales

b) Design a system to explain effects of oil spills on coastlines with examples of appropriate spatial objects and associated attributes. **[10]**

Total No. of Questions : 8]

SEAT No. :

P2904

[Total No. of Pages : 2

[4660] - 506

M.E. (Petroleum Engineering) (Semester - II)

ENVIRONMENTAL MANAGEMENT TECHNOLOGY AND SAFETY MEASURES

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Discuss the sources of various pollution in oil and gas Industry. Discuss the methods to minimize such pollution by the Oil and gas industry? **[25]**

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

a) Quality Environment Management

b) HAZOP Analysis

c) Meteorological Aspects of Air Pollutant Dispersion

Q3) a) Explain allowable limits for disposal of wastewater on to the land, in to sea and river as per the IS standards? Discuss in brief the effects if these limits are crossed. **[15]**

b) Discuss in details various methods available for oil spill control in marine environment. **[10]**

Q4) Discuss in detail on Environmental Regulations, sensitive habitants, Health and Safety Laws and quality assurance. **[25]**

P.T.O.

SECTION - II

Q5) Write notes on the following : **[25]**

a) Integrated Environmental Biotechnology in Petroleum Industry

b) Oilfield waste management

c) Methods for treatment of produced water

Q6) a) Describe the types of audits involved in environment management of oil Industry. How do they incorporate legal, ethical, social, and political issues? **[15]**

b) Write a note on "Accidents in oil industry and environmental degradation" **[10]**

Q7) Write notes on : **[25]**

a) Disaster management in Oil and Gas Industry

b) Environmental impact assessment

c) Preventive measures in Oil industry for fire and explosion hazards

Q8) a) Discuss Operational practices and procedures for solid waste disposal and hazardous waste. **[15]**

b) Explain in brief the techniques used in decommissioning of oil and gas installations. **[10]**

Total No. of Questions : 8]

SEAT No. :

P2905

[Total No. of Pages : 2

[4660] - 507
M.E. (Petroleum Engineering)
ADVANCED NATURAL GAS ENGINEERING
(2008 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Question No.4 & No.8 are compulsory.***
2) ***Attempt three questions from each section.***
3) ***Answers to the two sections must be written in separate answer book.***
4) ***Figures to the right indicates full marks.***
5) ***Neat diagram should be drawn wherever necessary.***
6) ***Use a non programmable calculator.***
7) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) a) With the following data, find the flow rate of the gas in cft/hr. Tb = 520 R, Pb = 14.7 psia, P1 = 400psia, P2 = 200 psia, d = 10 in, T = 520 R, L = 20 miles, gas gravity = 0.6, Z = 0.9, e = 0.0006 in. **[8]**

b) Explain construction, working and principle of horizontal separator with neat sketch? **[8]**

Q2) Explain the elements of orifice meter. What are the different pressure taps used in a flow measurement. Draw orifice meter diagram? **[16]**

Q3) a) Explain sonic and subsonic flow. **[5]**

b) Write about temperature at choke. **[5]**

c) Explain why choke is used in oil and gas wells? **[6]**

Q4) Write short note on: (any three) **[18]**

a) Pipeline efficiency and transmission factor

b) Liquid unloading

c) Gas hydrates

d) Two phase flow

P.T.O.

SECTION - II

Q5) a) Explain different methods of finding static and flowing BHP of a gas well? **[8]**

b) Explain Tubing pressure loss for liquid, gas and multiphase with figure? **[8]**

Q6) Explain criteria for selection of a flow meter? Explain construction, working and principle of any one flow meter? **[16]**

Q7) a) What is the criterion for choosing natural gas sweetening process? **[8]**

b) Draw and explain any one process of natural gas sweetening in detail? **[8]**

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

a) Pigging operations

b) Mollier charts in compression design

c) Gas well testing

d) Pseudo gas pressure

Total No. of Questions : 10]

SEAT No. :

P2906

[Total No. of Pages :3

[4660] - 508
M.E. (Petroleum) (Semester - II)
ARTIFICIAL LIFT TECHNIQUES
(2008 Pattern) (Elective - III)

Time : 3 Hours] *[Maximum Marks :100*

Instructions to the candidates:

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

SECTION - I

Q1) Classify different types of artificial lift systems and write the working principle of SRP, ESP, Plunger lift and Jet pump in brief. **[18]**

Q2) Discuss usability of Continuous gas lift, Intermittent gas lift and SRP only in terms of excellent/good/fair/poor in a tabular form for following well conditions. Low PI, Low GOR, adaptability to deviated wells, capability to produce sand, high volume lift capability and depth limits. **[16]**

Q3) a) Calculate the casing pressure at 8200 ft, required to open the valve if, Ab=0.77 inch^2, R = 0.087, Pd = 740 psi, Pt = 330 psi. What is the tubing effect caused by tubing pressure? How much pressure it would require to open the valve in the casing if, tubing pressure is zero psi at valve depth. Also explain meaning of spread and find its value for this valve.**[8]**

b) Draw the schematic sketch and explain in brief continuous flow gas lift system. **[8]**

P.T.O.

Q4) a) Which method or methods of artificial lifting you will propose for the following requirements and Why? Write in brief. **[8]**

i) Onshore oil production from deviated, medium GOR wells with sand production problems.

ii) Onshore heavy oil production from unconsolidated formation along with free gas.

b) Decide the depth of point of gas injection for a continuous flow injection and from your graph explain next steps to calculate daily requirement of total injection gas. Following data is available. **[8]**

Well depth = 8000 ft. Expected production rate = 900 bbls/day. Well head pressure, P_{wh} = 150 psig. Tubing size = 2 ⅜ inch. SBHP = 2750 psig. P.I. = 2.4 bbls/day-psi, Solution GOR = 250 SCF/STB. Sp. Gravity of injection gas = 0.68. S/C available pressure = 980 psig. °API = 38.S/C Temp. = 122°F. B.H. Temp.=222°F. 260 psi/1000 ft =flowing gradient of FBHP. 22psi/1000 ft = casing pressure gradient. Subtract 100 psi from the pressure at point of balance before you fix the point of gas injection.

Q5) a) Discuss the effect of following on functioning of ESP, **[8]**

i) ESP motor with insufficient mineral oil.

ii) Pump setting depth.

b) Draw typical standard performance curve for a submersible pump and define all the parameters required to read it. **[8]**

SECTION - II

Q6) Write in brief, the functions of different components required in SRP system. **[16]**

Q7) Draw neat schematic sketch of a surface and subsurface assembly of a Sucker rod pumping system and calculate: PPRL, MPRL, counterbalance required and peak torque for following well conditions. Pumping depth = 6800 ft, Desired fluid production = 210 bpd, Stroke length = 64 in, Volumetric efficiency = 73%, Pumping speed = 18 spm, Pump diameter = 1 ¼ inch. Rod number = API No.76 (1.791 lb/ft), Fluid specific gravity = 0.95. Indicate all the components. **[18]**

Q8) Write three important objectives of doing nodal analysis. Draw neat schematic sketch of a typical petroleum production system along with location of various nodes, features of it and possible pressure losses in a complete system. Write Inflow and Outflow expressions applicable at any six nodes of this production system and meaning of them in brief. **[16]**

Q9) What is the purpose of different methods of productive formation testing? Discuss any one in detail. **[16]**

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

a) Methods to evaluate and know formation damage.

b) Properties of Fracturing fluids.

c) Design considerations in stimulation job.

d) Fracture geometry.

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Total No. of Questions :8]

SEAT No. :

P2754

[Total No. of Pages :2

[4660]-51
M.E. (Civil Hydraulics Engg.)
b - COASTAL ENGINEERING
(2008 Course) (Elective - III) (Semester - II) (501311)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

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

SECTION -I

Q1) a) Derive expressions for particle kinematics in linear wave theory. **[8]**

b) Define shallow water, deep water, wave length, wave number. **[8]**

Q2) a) What is wave reflection? Discuss the factors on which reflection depends. Define surf similarity parameter. **[10]**

b) Derive equation for general refraction bye bathymetry. **[8]**

Q3) a) Discuss the process of wave measurement. Classify the waves. **[8]**

b) Define: Draw definition sketch of propagating wave and define related terms. **[8]**

Q4) Write short notes on (any four): **[16]**

a) Wave shaling,

b) Cnoidalwave theory,

c) Numerical wave modeling,

d) Choice of wave theory,

e) wave set up.

P.T.O.

SECTION -II

Q5) a) List theoretical wave spectra. Write in brief on JONSWAP spectrum. **[8]**

b) Discuss the phenomenon of littoral drift. What is longshore and cross shore littoral drift? **[8]**

Q6) a) What are various types of coastal protection works? Describe any two of them in detail? **[10]**

b) Discuss fall velocity, permeability for sediments. **[8]**

Q7) a) Derive equation for suspended load by currents. **[8]**

b) Discuss the environmental parameters which influence the coastal region. **[8]**

Q8) Write short notes on (any four): **[16]**

a) Uses of wave spectra,

b) Case study related to coastal erosion in India,

c) Initiation of sediment movement,

d) Mechanism of sediment transport,

e) Beach profiles.

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Total No. of Questions : 8]

SEAT No. :

P2907

[Total No. of Pages :3

[4660] - 510
M.E. (Petroleum Engineering) (Semester - II)
PIPING DESIGN AND ENGINEERING
(2008 Pattern) (Elective - III)

Time : 3 Hours] *[Maximum Marks :100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Discuss flow patterns and flow regimes with neat sketches in multiphase mixtures. **[10]**

b) Discuss in detail the piping codes and standards related piping design and engineering. **[15]**

Q2) A 150 NB schedule 40 pipe is employed to gaseous products at 40 bar pressure. Material of construction is carbon steel with safe stress value of 850kg/cm^2 at the operating temperature. Joint efficiency factor=85% and corrosion allowance=2 mm. Other data supplied: **[25]**

a) Moment of Inertia for 150 NB schedule 40 pipe(I) = 1075 cm^4

b) Section Modulus (z) = 155cm^3

c) Weight of empty pipe = 30 kg per meter.

d) Weight of pipe, full of water = 46 kg per meter.

e) Take E = 2.5 × 10^6 kg/cm^2

Calculate the following:

a) Longitudinal tensile stress due to internal pressure.

b) Safe support span (weight of gaseous products being small can be ignored)

c) Safe span if same pipe is employed for water service at the same temperature.

P.T.O.

Q3) A 12" (300 mm) NB pipe has an internal maximum operating pressure of 500 psig (35kg/cm^2/g) and temperature 357°C. The material of construction of the pipe is seamless carbon steel to ASTM A106 GrB. The recommended corrosion allowance is ⅛" (3mm). Calculate the thickness of pipe as per ASME B31.3 and select the proper schedule. **[25]**

Data:

Allowable stress as per ASME B31.3, S=16500 psi

Joint Quality factor as per ASME B31.3, E=1

Coefficient, Y=0.4

C=0.125 mm (Specified)

Q4) a) Discuss in detail piping fabrication and inspection and non-destructive testing methods used in Piping Engineering and design. **[15]**

b) Write a note on: Costing for piping system. **[10]**

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SECTION - II

Q5) a) Discuss with Process flow diagram the considerations for piping for shell and tube Heat Exchanger. **[15]**

b) Discuss in brief the design consideration for pipeline systems for petroleum products. **[10]**

Q6) Discuss the importance and principles of Piping Network analysis in Piping Engineering and design. Derive an equation for flow of liquids through circular pipe that relates relationship between friction head loss and flow as well as branch parameters (such as equivalent length and diameter) State the assumptions made in this derivation. **[25]**

Q7) Write notes on: **[25]**

a) HAZOP and HAZAN Studies.

b) Classification of loads and failure modes that are developed in a piping system.

c) Piping design for flow through perforated pipes and porous media.

Q8) A steam line from boiler house to the unit operation laboratory is to be installed. From the following data decide if the wall thickness and the expansion loop radius are properly selected. **[25]**

Data:

O.D.of Pipe	:	50mm
I.D.of pipe	:	40mm
Material of pipe	:	IS:1979-1961 St 30
Steam pressure	:	1.20MN/m^2
Steam temperature	:	180°C
Corrosion allowance	:	2mm
Mean radius of expansion loop	:	300mm
E α T for pipe material	:	380MN/m^2
Distance between two anchor points	:	55 m

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Total No. of Questions : 8]

SEAT No. :

P2908

[Total No. of Pages :3

[4660] - 515
M.E. (Information Technology) (Semester - I)
APPLIED ALGORITHMS
(2008 Pattern)

Time : 3 Hours] *[Maximum Marks :100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Prove the following by counter example **[4]**

For every positive integer n,n!< = n^2

b) Prove by Mathematical induction **[4]**

1 + 2 + ... + n = n (n +1)/2

c) What is asymptotic efficiency? Explain big O, Θ and Ω Notation. **[8]**

Q2) a) What is worst case, average case and best case time complexity of an algorithm? Write selection sort algorithm and analyze the same to find out its worst case, average case and best case complexity. **[8]**

b) Solve the following Recurrences. **[8]**

i) $$t(n) = \begin{cases} 0, if n = 0 \\ 5, if n = 1 \\ 3tn - 1 + 4tn - 2, \text{otherwise} \end{cases}$$

ii) $t_n - 2t_{n-1} = 3^n$

P.T.O.

Q3) a) What are immutable persistent data structures? Explain with suitable example zig-zig, zig-zag and zig type of splay operations on splay trees? **[8]**

b) Explain Dijkstra's algorithm for finding shortest path in a graph. Discuss best and worst case time complexity. **[8]**

Q4) a) What is convex hull problem? Write and explain Graham Scan algorithm to find convex hull. Also, discuss the time complexity. **[6]**

b) What is DAG? What is the property of DAG? Write a single source shortest path algorithm for DAG. Discuss the time complexity. **[6]**

c) Write and explain Heap Sort Algorithm. Discuss best, average and worst case complexity. **[6]**

SECTION - II

Q5) a) State and prove the Max-Flow min cut theorem. **[8]**

b) Write a linear time randomized minimum spanning tree algorithm using BORUVKA algorithm. **[8]**

Q6) a) Write and explain K-Server problem. Also discuss the time complexity. **[8]**

b) Given a linked list of length n, for each element i, compute its distance to the end of the list. Write a PRAM algorithm. **[8]**

d[i] = 0, if next[i] = nil

d[i] = d[next[i]]+1, otherwise

Q7) a) What is a α-Approximation algorithm? What are the characteristics of approximation algorithm? Write an approximation algorithm for Travelling salesperson problem. **[8]**

b) Write an algorithm for pointer doubling problem. What is its time complexity? **[8]**

Q8) a) Maximize $Z=3x+2y$ **[10]**

Subject to $2x + y <= 18$

$2x + 3y <= 42$

$3x + y <= 24$

$x >= 0, y >= 0$

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

i) NP-Hard Vs NP Complete Problems

ii) CRCW Vs EREW

Total No. of Questions : 8]

SEAT No. :

P2910

[Total No. of Pages : 2

[4660] - 517
M.E.I.T.
ADVANCED OPERATING SYSTEMS
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figure to the right indicates full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is Distributed Operating System (DOS) ? Explain transparency design issue along with its types in DOS. **[8]**

b) Enlist the commonly used models for configuring distributed computing systems. Explain the processor pool model with a neat diagram. **[10]**

Q2) a) Explain process addressing used in distributed operating system for the purpose of inter process communication. **[8]**

b) Explain the steps of a Remote Procedure Call (RPC) execution with a neat diagram. **[8]**

Q3) a) Explain any four consistency models used in distributed shared memory (DSM). **[8]**

b) What is the need for leader election in Distributed Operating System? Explain ring election algorithm with example. **[8]**

Q4) a) What is the necessity of a mutual exclusion in distributed system? Explain any one distributed mutual exclusion mechanism. **[8]**

b) What is the strategy used for handling a deadlock in distributed system? Explain any one deadlock detection algorithm. **[8]**

P.T.O.

SECTION - II

Q5) a) What do you mean by Load- Balancing approach? Explain any one approach for load balancing in distributed system. **[8]**

b) Explain the features of a global scheduling algorithm. **[8]**

Q6) a) With respect to distributed file system explain the following : **[8]**

i) File sharing semantics

ii) File replication

b) With respect to a NFS distributed file system, explain : **[8]**

i) Transparency

ii) File access model

Q7) a) What is process migration? Explain the state of a process prior to migration and after the migration. **[8]**

b) Explain a technique for thread migration in distributed system. **[8]**

Q8) Write short notes on the following (any three) : **[18]**

a) RPC in Amoeba

b) DCE

c) Logical Clock Synchronization

d) Page-based DSM

e) Task Assignment Approach

Total No. of Questions : 8]

SEAT No. :

P2911

[Total No. of Pages : 3

[4660] - 518

M.E. (Information Technology)

A : SOFTWARE ARCHITECTURE

(2008 Pattern) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain following aspects of Software Architecture : **[8]**

i) Design Plan of a System.

ii) Abstraction to manage the complexity of a system.

b) Explain Conceptual Architecture View and its design activities with suitable example. **[8]**

Q2) a) Explain ANY TWO of the following Architectural structures of a system in context of Elements, Relations, Constraints and Purpose (what it's for) : **[6]**

i) Layered style in Module based structure

ii) Client-Server style in Component and Connector structure

iii) Deployment style in Allocation structure

b) Discuss "Architecture, by itself, is unable to achieve quality. But it provides the foundation for achieving quality". **[4]**

P.T.O.

c) Explain following measures related to Performance quality attribute : **[06]**

i) Throughput

ii) Response Time

iii) Deadlines

Q3) a) Why Document Software Architecture? Brief seven rules for sound documentation? **[10]**

b) What is the difference between : **[6]**

i) Interface and connector

ii) Interface and port

iii) Module and Component Interfaces

Q4) a) Explain ANY TWO of the following Design Patterns in details : **[12]**

i) Abstract Factory

ii) Decorator

iii) Prototype

b) Consider an application where there is an excel sheet to hold exam results i.e. student-wise marks. We could like to draw a Bar-chart showing comparison of individual students as well as PIE chart to show comparison between total passed, failed and First class students. **[6]**

i) What is Observer Pattern?

ii) Show how observer pattern can be applied in above scenario.

SECTION - II

Q5) a) Explain "Chain of Responsibility, a Behavioral Pattern, provides loose coupling between Sender of request to its Receiver'. **[8]**

b) Explain how Design patterns solve design problems. **[8]**

Q6) a) Discuss design and programming challenges associated with building concurrent and network systems. **[8]**

b) What are problems of Concurrency? Explain Isolation and Immutability solution for Enterprise Applications. **[8]**

Q7) Explain ANY FOUR of the following concept : **[16]**

a) Levels of EAI

b) Advantages and disadvantages of EAI

c) User Interface Level EAI

d) Transactional Middleware and EAI

e) Message Broker.

Q8) Explain ANY THREE of the following : **[18]**

a) Domain Logic Patterns.

b) Data Source Architectural Patterns

c) Object-Relational Behavioral Patterns

d) Object-Relational Structural Patterns

e) Offline Concurrency Patterns.

Total No. of Questions : 10]

SEAT No. :

P2912

[Total No. of Pages : 3

[4660] - 519

M.E. (Information Technology)

REAL TIME AND EMBEDDED SYSTEM

(2008 Pattern) (Elective - I (B))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***

SECTION - I

Q1) a) Explain embedded system design process with stages and what are the support tools required for the embedded system design process? **[8]**

b) Discuss the advantages and disadvantages of top-down and bottom-up design process in embedded system design. **[8]**

Q2) a) What are interrupt sources in ARM processor? Describe the interrupt mechanism in ARM processor. **[8]**

b) Discuss the programming model in SHARC processor with the help of register organization. What is saturation arithmetic and how it is handled in SHARC processor? **[10]**

Q3) a) Explain the clock synchronization and how clock synchronization is used as handshake in I2C bus with suitable clock diagram. **[8]**

b) What is distributed network architecture in embedded system? Explain with suitable examples. **[8]**

P.T.O.

Q4) a) List various exception vectors of the ARM processor as per the priority. Explain the exception handling process in the ARM processor. **[10]**

b) Draw SHARC core processor block diagram and explain the common architectural features of SHARC processor. **[8]**

Q5) Write short note on any four : **[16]**

a) Caching in ARM processor.

b) Release time Vs Dead line.

c) Myrinet bus

d) Quality assurance in embedded system.

e) Implementation of clock driven scheduling.

SECTION - II

Q6) a) What is SDL? Draw language specification on symbols and explain in brief. **[8]**

b) Draw flow chart for Ethernet CSMA/CD algorithm and explain the same. **[8]**

Q7) a) Discuss and prove that clock driven scheduling performs better in design deterministic systems. **[8]**

b) Discuss the classification of the scheduling algorithm. Write comparison and contrast between static Vs dynamic scheduling algorithm with examples. **[8]**

Q8) a) Briefly describe the difference between waterfall and spiral development module. **[6]**

b) What is CRC card? Discuss the steps necessary for analyzing the system for using this methodology **[10]**

Q9) a) Discudss the rules for computation of effective release time and effective deadline. **[8]**

b) Discuss the data transfer format of I2C bus with respect to read and write. **[8]**

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

a) Hardware / Software design methodology

b) Arbitration in CAN bus

c) Aperiodic Or Sporiodic task

d) Optimal Scheduling

Total No. of Questions : 8]

SEAT No. :

P3451

[Total No. of Pages : 2

[4660]-52
M.E. (Civil) (Hydraulics)
WATER MANAGEMENT AND CONVEYANCE SYSTEM
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Solve any Three questions from each Section.***
2) ***Figures to the right indicates full marks.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Discuss in brief about dissolve oxygen model? **[9]**

b) Describe in details about pollutant transport mechanisms? **[9]**

Q2) a) Discuss in details about reservoir analysis. **[8]**

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

i) Urban Drainage

ii) Run off control

Q3) a) Discuss in brief about toxic substances and heat management in water management? **[8]**

b) What do you mean by local water problem and global water problem? And also explain feasible solutions to these problems? **[8]**

Q4) a) What is the basic mechanism of river flow? Discuss in details about the component of self-weight of water which is responsible for the flow of water in a river. Explain it with a proper sketch which will show the component of self weight of the water within control volume responsible for flow in a channel. **[8]**

b) Discuss in details about the nature of waste input to water system. Classify the difference between the point source and non point source of loading system. Give two examples for each? **[8]**

P.T.O.

SECTION - II

Q5) a) Discuss in details about effect of hydraulic structures on river surface profiles. **[8]**

b) "Urban drainage and runoff control is a challenge to the city engineers". Justify this statement and how to solve this problem. At least discuss about one method by which this problem can be minimized to a considerable extent. **[10]**

Q6) a) What are the measure economic Aspect and Decision making related to the growth of a hydroelectric power plant? Discuss them inbrief. **[10]**

b) Draw the neat sketch of a hydroelectric power plant and label all the parts. **[6]**

Q7) a) Discuss in detail about Water Tariff structure along with examples. **[8]**

b) Determine the quantity of bed load transported through a trapezoidal channel by using M-P-M equation with the following data: **[8]**

i) Depth of Flow = 2.6 m

ii) Width of Channel - 3.2 m

iii) Bed Slope = 1:4500

iv) Uniform Size of the bed material = 0.30 mm

v) Side slope = 0.5 (H) : 1.0 (v)

Manning's n = 0.02

Q8) a) Draw the sketch of "Diversion Head Works and Show all the important parts of it. **[8]**

b) Discuss at length about national water problems and global water problems. **[8]**

Total No. of Questions : 12]

SEAT No. :

P2913

[Total No. of Pages : 3

[4660] - 520

M.E. (Information Technology) (Semester - II)

BIOINFORMATICS (Elective - I)

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Define Bioinformatics. Explain composite and structural databases in Bioinformatics with suitable example of each. **[8]**

b) Explain the significance of central dogma for molecular biology with neat diagram. **[8]**

OR

Q2) a) Explain the significance of DNA, RNA and protein molecules in information flow in Bioinformatics. **[8]**

b) Write a note on data analysis and management in Bioinformatics. **[8]**

Q3) a) What are intons and exons? What is their significance in Bioinformatics? Explain genome rearrangement in genomic sequences. **[10]**

b) List the various data mining tools in Bioinformatics. Draw a neat diagram and explain in detail the steps involved in knowledge discovery process. **[8]**

P.T.O.

OR

Q4) a) Write a note on : **[8]**

i) Protein folding

ii) Dot matrix analysis for sequence alignment

b) Explain the structure of DNA and RNA in brief with suitable diagram. Why there is need for DNA replication in Bioinformatics. **[10]**

Q5) a) List the major methods for sequence alignment. Explain any one in detail with suitable diagram. **[8]**

b) Explain secondary and tertiary protein structures. **[8]**

OR

Q6) a) Describe FASTA tool for sequence alignment. Explain the steps used to calculate similarity scores between a pair of sequences. **[8]**

b) What is gapped - BLAST? Explain 'two-bit method' with respect to gapped - BLAST. **[8]**

SECTION - II

Q7) a) Write a note on gene expression. What is the significance of gene expression in Bioinformatics? **[8]**

b) Explain similarities and differences in BLAST and FASTA approaches. What is PSI-BLAST? Explain application areas of PSI-BLAST. **[10]**

OR

Q8) a) What is DNA microarray technology? Explain the process of microarray data analysis using spolting array technique with neat diagram. **[10]**

b) Discuss the various protein structure databases in brief. **[8]**

Q9) a) Mention the different structure visualization techniques in Bioinformatics. Explain any two in brief. **[8]**

b) Explain Hidden markov model process for secondary structure analysis and prediction. **[8]**

OR

Q10) a) What is proteomics? Discuss tools and techniques in proteomics in brief. **[8]**

b) Differentiate between genomics and proteomics. **[8]**

Q11) a) What is drug discovery? Explain any two areas influencing drug discovery in detail. **[8]**

b) Explain with neat diagram the process of cell cycle with regards to drug discovery in Bioinformatics. **[8]**

OR

Q12) a) Which important parameters are considered in drug discovery? Explain drug discovery pipeline in brief. **[8]**

b) Explain process of drug discovery with respect to target identification and target validation. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2914

[Total No. of Pages : 2

[4660] - 521

M.E. (Information Technology) (Semester - I)

INFORMATION ASSURANCE & SECURITY

(2008 Pattern) (Revised)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Draw & explain security detense methods. **[9]**

b) Explain case study of secured healthcare. **[9]**

Q2) a) List and explain hacking steps. **[8]**

b) Explain networking monitoring tools. **[8]**

Q3) a) Explain any one IDS tool. **[8]**

b) Draw & explain digital signatures. **[8]**

Q4) a) Explain types of firewalls. **[8]**

b) Compare symmetric key & public key systems. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain operating system security. **[9]**

b) Draw & explain online payment system. **[9]**

Q6 a) Illustrate case study of industrial espionage. **[8]**

b) Illustrate traditional database system security. **[8]**

Q7) a) Digital forensic good or bad? Justify. **[8]**

b) List and state steps of risk mitigation. **[8]**

Q8) a) Explain evolution of security standard. **[8]**

b) Explain the security infrastructure in practice. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2915

[Total No. of Pages : 2

[4660] - 522
M.E. (Information Technology)
B : NETWORK PROGRAMMING (Elective - II)
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the Candidates :

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

SECTION - I

Q1) a) A connection is established between a host on an Ethernet, whose TCP advertises an MSS of 1,460, and a host on a Token Ring, whose TCP advertises an MSS of 4,096 Neither host implements path MTU discovery. Watching the packets, we never see more than 1,460 bytes of data in either direction. Why? **[8]**

b) Write a program to issue RTM_GET command on routing Socket. **[8]**

Q2) a) Explain TCP State Transition Diagram for Opening & Closing a connection. **[8]**

b) Define following Resource Records (RR) : **[8]**

i) AAAA ii) PTR

iii) MX iv) CNAME

Q3) a) Discuss in detail Multicast and Broadcast forms of addressing. **[8]**

b) State & explain Pseudo code name and Index functions. **[8]**

Q4) Write short notes on : **[18]**

a) Multicast and Broadcast

b) Thread synchronization

c) Resource Records (RR)

P.T.O.

SECTION - II

Q5) a) Write a program that prints the default TCP, UDP, and SCTP send and receive buffer sizes and run it on the systems to which you have access. **[8]**

b) Assume two TCP clients start at about the same time. Both set the SO_REUSEADDR socket option and then call bind with the same local IP address and the same local port (say 1500). But, one client connects to 198.69.10.2 port 7000 and the second connects to 198.69.10.2 (same peer IP address) but port 8000. Describe the race condition that occurs. **[8]**

Q6 a) Write a program for TCP based echo server using Threads. **[8]**

b) What are concurrent servers? How UDP server deals with different types of servers? **[8]**

Q7) a) Explain in detail Web Client and Simultaneous Connections using threads. **[8]**

b) Explain TCP prethreaded server with : **[8]**

i) Per thread accept

ii) Main thread accept.

Q8) Write short notes on : **[18]**

a) Broadcast addresses

b) Resolver and Name Servers

c) Unicast versus Broadcast

Total No. of Questions : 10]

SEAT No. :

P2916

[Total No. of Pages : 3

[4660] - 523

M.E. (Information Technology)

C : GEOGRAPHICAL INFORMATION SYSTEMS

(2008 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the Candidates :

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

SECTION - I

Q1) a) Explain the three important components of GIS. Also explain raster and vector data structure. **[8]**

b) What is the need of image enhancement? Explain any one Image Enhancement techniques in brief. **[8]**

Q2) a) Explain the four key activities that any urban planner or scientist use geographic information. **[8]**

b) Differentiate between active and passive remote sensing. **[8]**

Q3) a) What is Synthetic Aperture Radar? How SAR images are interpreted? **[8]**

b) What is the need of preprocessing an image? Explain radiometric correction methods. **[8]**

P.T.O.

Q4) a) Explain Electromagnetic remote sensing process in brief. Draw suitable diagram. **[8]**

b) Define map and map scale. Also explain map as model. **[8]**

Q5) a) What are the common errors in GIS database? Explain with suitable examples how these errors can be corrected? **[9]**

b) What is Vegetation Index? Explain NDVI transformation and its applications. **[9]**

SECTION - II

Q6) a) List different data sources and methods which can be used to create new data for GIS applications. **[8]**

b) List and explain four types of data or levels of measurement. Give suitable examples. **[8]**

Q7) a) Explain the basic aim of three earth recourses satellite series. **[8]**

b) Explain "atmospheric scattering" and "atmospheric windows" w.r.t. Atmospheric. Interactions with Electromagnetic Radiation. **[8]**

Q8) a) Explain the application of GIS and remote sensing in hazard mitigation and water shed management. **[8]**

b) Discuss briefly the impact of the internet on GIS. **[8]**

Q9) a) Identify some of the major issues which need to be considered when setting up a web-based GIS. **[8]**

b) What is geocoding? Explain the geocoding process with example. **[8]**

Q10) Write short notes on any THREE of the following : **[18]**

a) Interpolation

b) Spatial data processing

c) Land cover system in India

d) Object oriented GIS

e) Image Registration

f) Topographical mapping

Total No. of Questions :6]

SEAT No. :

P2755

[Total No. of Pages :2

[4660]-56
M.E. (Civil - Structures)
STRUCTURAL DYNAMICS
(2008 Course) (Semester - I) (501403)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***If necessary, asssume suitable data and indicate clearly.***
5) ***Use of electronic pocket calculator is allowed.***

SECTION -I

Q1) a) Idealize a transmission tower as a single degree of freedom system and write the equation of motion. **[5]**

b) Derive the expression for response at resonance. **[10]**

c) Write a note on different forms of damping. Give suitable examples. **[10]**

Q2) a) Derive the expresssion for dynamic magnification factor for an undamped system. **[15]**

b) What do you understand by transient response and harmonic response? Give suitable examples. **[10]**

Q3) a) The displacement of a single degree of freedom system due to a forcing function is obtained for two excitation frequencies. Obtain the damping ratio for the following conditions: at $\omega = \omega_n$, $x_0 = 125$ mm; $\omega = 5\ \omega_n$, $x_0 = 0.5$ mm. **[15]**

b) Explain average acceleration and linear acceleration methods. **[10]**

P.T.O.

SECTION -II

Q4) a) Define modal damping ratio and modal participation factor. **[10]**

b) Find the natural frequencies and mode shapes for the system shown in Fig.1 **[15]**

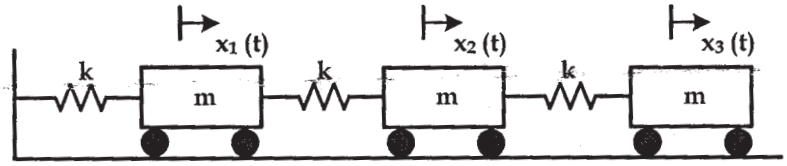

Fig. 1

Q5) a) Explain Stodola method with a suitable example. **[15]**

b) What is non-linear analysis? How is it performed? **[10]**

Q6) a) What are continuous systems? Give suitable examples. **[10]**

b) A cantilever beam is subjected at an axial load F at its free end. Obtain the solution when the force F is suddenly removed. Assume the following data: cross sectional area = A, density = ρ,Young's modulus = E and span =1. **[15]**

EEE

Total No. of Questions : 6]

SEAT No. :

P2756

[Total No. of Pages : 2

[4660]-57
M.E. (Civil) (Structures)
a-ADVANCED DESIGN OF CONCRETE STRUCTURES
(501404) (2008 Pattern) (Semester-I) (Elective-I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each Section***
2) ***Answer to two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IS 456, IS 1343, IS 3370 & non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data if necessary.***

SECTION-I

Q1) a) Draw yield lines for the following: **[8]**

i) Triangular slab with fixed supports on two adjacent sides with remaining side unsupported.

ii) Pentagonal slab fixed at three adjacent sides, other two sides simply supported.

b) Design a RCC slab for a square hall of clear span 5m using Yield Line Theory. Assume the peripheral support thickness 300mm, the slab is simply supported Use M20 Fe 500 take Live load = 4 kN/m^2 & floor finish load = 1.2 kN/m^2. Draw reinforcement details. **[10]**

c) Explain Hillerborgs strip method with sketches. **[7]**

Q2) a) Design a flat slab for a hall with column spacing 6m × 6m c/c. the size of the column is 500mm dia each Use M25 Fe 500 take Live load = 4.5 kN/m^2 & floor finish load = 1 kN/m^2. Draw reinforcement details. **[10]**

b) Design a grid slab for a floor of hall 10.5 × 13m c/c having square grid of 1.5m. Use M20 Fe 500 take Live load = 5 kN/m^2 & floor finish load = 1 kN/m^2. Apply the required check & draw reinforcement details. **[15]**

P.T.O.

Q3) Design a staging for circular type ESR for 4 lakh liters with staging height 9m using M25, Fe 500 in earthquake zone III. Safe bearing capacity is 200 kN/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, columns and foundations. Draw the reinforcement details. **[25]**

SECTION-II

Q4) a) Design deep beam of a hall for flexure and shear for the following Clear span = 4.5m, width of support = 450mm, working UDL on the beam 1000 kN/m. Take the total depth of beam = 3.2m Use M30 & Fe 500. Show all Analysis and Design calculations & draw the reinforcement deatils. **[18]**

b) Write detailed note on coupled shear wall. **[7]**

Q5) A two span prestressed concrete continuous beam ABC having cross section 230 × 750 mm simply supported at A & C and continuous over B with M45 and multistrand cables 2 Nos 12T 13 with fy = 1900 N/mm^2 stressed to 75% of fy, each span is of 15m, superimposed load on both the spans 14 kN/m, Assume 15% loss of prestress. **[25]**

a) Determine primary, secondary moment at support at prestress and dead load.

b) Calculate shift, and stress in extreme fibers at working load.

c) Draw the resultant line of thrust at working load.

Q6) Design post tensioned prestressed concrete slab for a floor for the following Flat interior panel of 7m × 9m, live load on slab 5 kN/m^2, floor finish load on slab = 1 kN/m^2, concrete grade M50 HT steel is S3 cables of cross sectional area of each strand 150 mm^2 with fy = 1900 N/mm^2 Design cables to serve as beams. Assume 3 panels in each direction (floor size 24m × 24m) width of the beam on periphery of floor 600mm and column size 600mm × 600mm. Design must include check fiber stresses in concrete and deflection. Draw sketches showing cable profiles. **[25]**

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Total No. of Questions : 6]

SEAT No. :

P2757

[Total No. of Pages : 3

[4660]-58
M.E. (Civil) (Structures)
b-STRUCTURAL DESIGN OF CONCRETE BRIDGES
(501404) (2008 Course) (Semester-I) (Elective-I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) List the factors affecting bridge site location stating their importance. **[9]**

b) Write short note on IRC 70R loading on bridges. **[8]**

c) Write detailed note cellular girder bridge. **[8]**

Q2) a) What are the factors affecting the span of bridge, Derive the conditions for 'Economical span' of bridge stating the assumptions made. **[8]**

b) Design the slab culvert with the data: **[17]**

Clear span of the culvert = 4.5m

Clear carriage way width = 7.5m

Size of kerb = 200mm × 600mm

Average thickness of wearing coat 100mm

Use material M25, Fe 500

Loading class A

The design of substructure is not required.

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

P.T.O.

Q3) Design slab, cross girder and main girder of RCC T-beam and slab girder deck for the crossing of a national highway. The carriage way is 7.5m and the footpaths of 1.2m on either side. The span of the beam is 10.5m. The cross girders are spaced at 3.5m c/c. The cross section is as shown in figure Fig. 1. Consider interior panel of the deck slab. Place the loads so as to produce critical SF and BM in the deck slab and girder. Draw neat sketches showing details of reinforcement in plan and elevation. Take the spacing of cross girders as 3m C/C. Assume suitable cross section of the curbs. Use M30 Fe 500. **[25]**

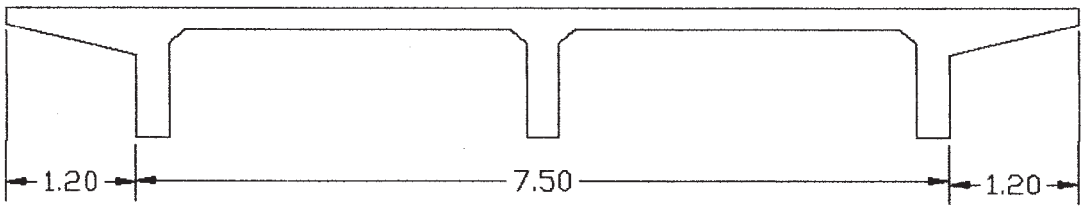

Fig1 (All dimensions are in meters)

SECTION-II

Q4) a) Differentiate between rigid frame bridges are different from simply supported bridges with appropriate explanatory sketches. **[9]**

b) Explain Necessity and functions of expansion joint. **[8]**

c) Describe different factor affecting the design bridge foundations. **[8]**

Q5) a) Write a short note on elastomeric bearing with sketches. **[5]**

b) Design a reinforced elastomeric bearing to support a PSC girder of a bridge with following data. **[20]**

Maximum vertical load = 1100 kN

Dynamic vertical load = 100 kN

Transverse lateral load = 50 kN

Longitudinal load = 60 kN

Longitudinal total translation 12 mm

Rotation at support 0.003°

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

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

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

Q6) a) Check the stability of the abutment for the following: **[17]**

Top width of abutment = 1m

Height of abutment = 4m.

Front face of abutment is vertical

and the back face is battered at 1:6

Material of abutment stone masonry.

Unit Weight of soil = 18 kN/m^3

Angle of repose = 28°

Superstructure: A Team-bridge with span 15 m.

Type of loading: IRC class AA

b) List merits and demerits of different types of caissons used for bridge foundations. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P2758

[Total No. of Pages : 2

[4660]-59
M.E. (Civil Structure)
c-DESIGN OF COMPOSITE CONSTRUCTION
(501404) (2008 Pattern) (Elective-I) (Semester-I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain specific distinction in India, BS & Euro code with reference to composite construction. **[9]**

b) Explain with suitable illustration, the elastic behavior of Composite Beam. **[8]**

c) Explain design philosophy for composite member design. **[8]**

Q2) a) Explain Pro-filled sheeting, its utility, applications, its material properties. **[9]**

b) Explain longitudinal shear, longitudinal slip, deflection, vertical shear. **[8]**

c) Explain buckling of flanges and web of beam. **[8]**

Q3) a) Explain behavior of concrete filled column under axial load with circular section. **[8]**

b) Write steps in design of Profilled decking. **[8]**

c) Write steps in design of composite slab. **[9]**

P.T.O.

SECTION-II

Q4) a) Explain use of composite truss in modern times; illustrate its utility over conventional steel truss. **[8]**

b) Explain design of composite truss with shear connectors. **[9]**

c) Draw arrangement of composite truss along with details of connectors. **[8]**

Q5) a) Comment on fire resistant behavior of composite construction. **[8]**

b) Explain geometric imperfections at connections, how are they eliminated. **[8]**

c) Sketch typical composite foundation showing important details. **[9]**

Q6) a) Sketch composite bridge deck slab with showing all important features. **[8]**

b) Explain steps to design cantilever deck slab using composite construction. **[8]**

c) Design composite simply supported beam of span 6 meters to carry load 5 KN/m using composite construction. Select appropriate constituents for composite construction. Assume their appropriate properties for design. **[9]**

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Total No. of Questions : 8]

SEAT No. :

P3289

[Total No. of Pages : 2

[4660] - 6

M.E. (Civil) (Construction Management)

REPAIRS, REHABILITATION, RETROFITTING OF STRUCTURES

(2008 Pattern) (Elective - I) (C)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Question No. 1 and 5 are compulsory. Out of the remaining attempt any two questions from Section - I and two questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Differentiate between repairs retrofitting and rehabilitation with an example. And discuss the holistic model of deteriorations of RCC structure.? **[8 + 10]**

Q2) Explain the factors to be considered for selection of repairs methods and its different stage and the aramid and carbon fiber wrappings procedure with suitable example? **[8 + 8]**

Q3) Explain the rehabilitation procedures for under water piers? What are Predictive performance models and its advantages? **[8 + 8]**

Q4) Explain the use of nanotechnology for repairs, rehabilitation and types of various types of fiber wrappings? **[8 + 8]**

P.T.O.

SECTION - II

Q5) Explain in details what are the factors related to building damages due to earthquake and procedure adopted by BIFR for a heritage building? **[8 + 10]**

Q6) Describe the financial feasibility study for repair of Pratapgad Fort? **[16]**

Q7) State the data collection required for maintenance of heritage port and types of seismic retrofitting with fig.? **[8 + 8]**

Q8) Discuss the various challenges faced by earthquake engineer for rehabilitation a RCC building in India. **[16]**

Total No. of Questions : 6]

SEAT No. :

P2759

[Total No. of Pages : 3

[4660]-60
M.E. (Civil) (Structure)
d-DESIGN OF FOUNDATION
(501404) (2008 Pattern) (Semester-I) (Elective-I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each Section***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed & IS codes are not allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Your answers will be valued as a whole.***

SECTION-I

Q1) a) Explain the following: **[15]**

i) Proportioning of footing.

ii) IS-1892-1979, provisions for soil exploration.

iii) USCS.

iv) Soil Structure Interaction.

v) Teng's correlations.

b) For a framed structure, a column footing of size 2.5m × 3.5m, transmits a pressure increment of 160 kN/m^2, at its base embedded in sand 1.6m, below GL. Total depth of sand below GL is 3.6m & below it, 2m deep clay was found. Assuming pressure distribution of 2 V: 1H, compute the consolidation settlement at the middle of clay layer. Consider the pressure variation across the 2m deep clay layer. **[10]**

i) For sand, γ = 18 kN/m^3 & γ_{sat} = 21 kN/m^3.

ii) For clay. γ_{sat} = 18 kN/m^3, Cc = 0.26, w = 35%, G = 2.7.

Assume GWT at 2.6m below GL.

P.T.O.

Q2) a) Explain the design steps, with sample calculations, for- **[16]**

i) Flat slab Raft

ii) Beam & Raft (slab) foundation.

b) Discuss the conditions favouring the design of different types of raft foundations. **[9]**

Q3) a) Compare in the light of IS-2974 (pt-II)-1966, design of foundations for, **[15]**

i) Rotary machines

ii) Impact machines.

b) A machine having a weight of 20,000 kN has an unbalance, such that it's subjected to a force of 5,000 kN at a frequency of 600 rpm. What should be the spring constant (K) for the supporting springs if the max force transmitted to the foundation due to the machine is 500 kN? Neglect damping. **[10]**

SECTION-II

Q4) a) Explain the following:

i) Design steps for precast & cast-in-situ piles. **[15]**

ii) Converse La-barre's formula & Feld's rule.

iii) Positive & Negative skin friction.

b) Compute the settlement of pile group to carry a load of 3500 kN, including the wt. of pile cap, for a 20m deep clay. Width of pile cap is 5.5m. Length of pile is 12m with 0.6 mϕ. The q_u = 80 kN/m^2, clay is underlain by rock. The load is to be transferred at 2/3 length of the pile. Assume the pressure distribution at 30° (degree).

LL is 70% & FOS against shear is 03. **[10]**

Q5) a) Explain by sample calculations, determination of the following parameters, for a LLP, using 'Reese & Matlock' method, if the pile head is free, **[10]**

i) Total deflection.

ii) Total slope.

iii) Total moment.

iv) Total shear.

v) Total soil Reaction.

b) Design an RCC precast pile to sustain a working load of 1000 kN. L = 12m, ϕ = 0.5m. q_u = 80 kN/m^2. Assume suitable size for reinforcement & apply check for handling stresses. **[15]**

Q6) a) Explain by sample calculations, the steps for 'Design of pile cap'. **[9]**

b) Discuss the applicability of different 'Shell Foundations' in the light of IS code recommendations. **[8]**

c) Compare Hyper & Conical RC shell foundations with & without edge beams. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P2760

[Total No. of Pages : 2

[4660]-61
M.E. (Civil Structures)
a-ADVANCED DESIGN OF METAL STRUCTURES
(501405) (2008 Pattern) (Semester-I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) Suggest structural configuration of hoarding structure to be installed at height of 25m above ground level. The display board is of dimensions 20m wide, 13m height. Calculate the loads due to wind on the members of support structure. Draw free body diagram of structures showing the forces and reactions. **[25]**

Q2) a) Explain castellated beam and how they are fabricated. **[9]**

b) What are the advantages and disadvantages of castellated beam? **[8]**

c) List the applications of castellated beam. **[8]**

Q3) a) Compare advantages and disadvantages of steel and aluminum structural sections. **[8]**

b) Compare and Draw stress-strain diagram of aluminum and steel. **[8]**

c) Find safe load carrying capacity of IS ALB 150 at 12.1 kg/m in flexure. **[9]**

P.T.O.

SECTION-II

Q4) a) Differentiate from structural aspect, Microwave tower and transmission tower carrying high tension electric wire. **[5]**

b) Draw typical structural arrangement of both. **[5]**

c) Draw typical Free body diagram with conventional loads on each type of tower. **[5]**

d) Design the foundation bolt for transmission tower one of the four legs with angle section has to transfer tensile reaction of 500 KN to foundation block. The cross-section of tower leg is ISA 100*100*8. Draw the schematic arrangement. **[10]**

Q5) a) State advantages and disadvantages of tubular structural sections used in steel structures. **[6]**

b) What are the design considerations of tubular structure. **[6]**

c) Design scaffolding structure made of tube 4.5m long to carry axial compression of 210 KN. **[13]**

Q6) a) Explain manufacturing of light gauge structural members. Enlist its advantages over conventional sections. **[10]**

b) Find allowable load per meter on a beam having channel section 100mm*75mm, 12 mm long stiffened lip, light gauge. The beam has effective span 2.5m permissible σ_{bt} = 125 Mpa, Y_{st} = 232 Mpa. **[15]**

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Total No. of Questions : 6]

SEAT No. :

P3457

[Total No. of Pages : 3

[4660] - 62

M.E.(Civil) (Structure)

STRUCTURAL DESIGN OF STEEL BRIDGES

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

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figure to the right indicates full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of cell phone is prohibited in the examination hall.***
7) ***Use of electronic pocket calculator, latest IS codes and steel table is allowed.***

SECTION - I

Q1) a) State and explain different factors for the selection of type of steel bridges. **[8]**

b) Enlist the different methods for the erection of steel bridges. Explain any one in details. **[8]**

c) Enlist the different type of loads and forces for highway steel bridges. Explain significance of wind load for the design of bridges. **[9]**

Q2) A deck type plate girder railway bridge of span 20 m is provided for a single broad gauge track. The self weight of stock rails and check rails are 0.8 and 0.4 kN/m respectively. The self weight of sleepers is 3.2 kN/m. Design an economical cross section of plate girder and horizontal truss bracing. Draws the design sketches for the bridge structures. The EUDL for B M is 2027 kN, for S F is 2224 kN and impact factor is 0.588. **[25]**

P.T.O.

Q3) a) Draw the sketch showing different component of through type truss girder railway steel bridge. **[5]**

b) A through type railway truss girder bridge consists of two Pratt trusses as shown in Fig. 3 b. The bridge supports an equivalent uniformly distributed live load 125 kN/m. The dead load of each truss inclusive of self weight is 20 kN/m. Draw the influence line diagram and find force in members U_2U_3, U_2L_3, L_2L_3 and U_3L_3. Assume the impact factor to be 15%. **[20]**

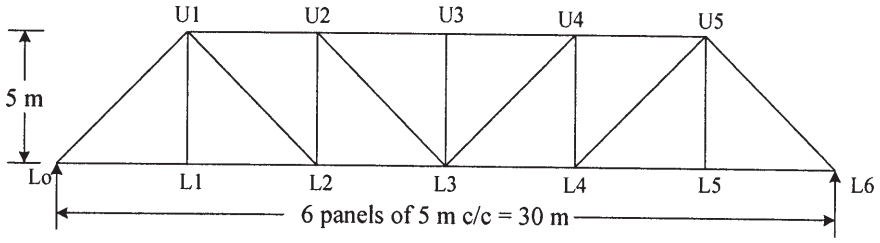

Fig. 3 b

SECTION - II

Q4) The effective span of a deck type plate girder two lane highway bridge is 24 m. The reinforced concrete slab is 250 mm thick inclusive of the wearing coat. The foot paths are provided on either side of the carriage way. Design the maximum section of plate girder, if the bridge is to carry IRC class A loading as shown in Fig. 4. **[25]**

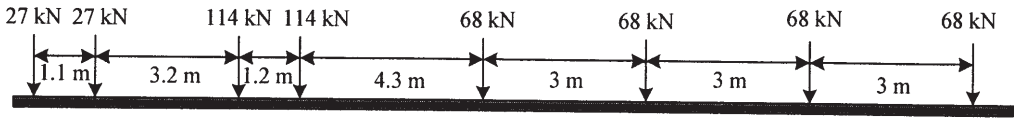

Fig. 4. IRC Class A Loading

Q5) The effective span of through type truss girder highway two lane bridge is 20 m. The reinforced concrete slab is 250 mm thick inclusive of the wearing coat. The foot paths are provided on either side of the carriage way. The spacing between centre to centre of truss girder is 12 m. The highway bridge is to carry IRC class A standard loading. Suggest a suitable truss girder for the bridge. Design the central top and bottom chord members of the central panel. **[25]**

Q6) a) Explain in brief type of bearing in steel bridges with sketches. **[10]**

b) The effective span of truss girder through type bridge for a single broad gauge track is 30 m. Reaction due to dead load, live load and impact load is 1500 kN. Vertical reaction due to wind is 250 kN. Tractive force is 476 kN and breaking force is 600 kN. Design the rocker bearing and draw design sketch. **[15]**

Total No. of Questions : 6]

SEAT No. :

P2761

[Total No. of Pages : 2

[4660]-63

M.E. (Civil-Structures)

c-PLASTIC METHOD FOR ANALYSIS AND DESIGN OF STEEL STRUCTURES

(501405) (2008 Course) (Elective-II) (Semester-I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each Section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat sketches must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable calculator, IS: 800-2007 and steel table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) State and explain the concept of plastic hinge. **[4]**

b) A simply supported beam of T section is subjected to sagging bending moment. Find the shape factor if permissible yield stress in compression and tension is 280 MPa and 320 MPa respectively. The section has following dimensions:

Top flange = 180 mm × 20 mm

Web = 25 mm × 165 mm (excluding top flange) **[14]**

c) A simply supported beam of span '*l*' is subjected to central load 'W'. In progressive loading when W reaches to W_p-plastic collapse occurs. Draw a neat sketch showing zone of plasticity in the beam. State the equation for depth of yielding 'e' at any section in zone of plasticity. **[7]**

Q2) a) A continuous beam ABCD is simply supported at A, B, C & D. Spans AB = 5m, BC = 7m & CD = 5m. Mp is uniform. It is subjected to factored loads as under. **[12]**

i) Total udl value on AB & CD = W.

ii) Concentrated load 2W at center of BC.

Find collapse load 'W' & draw statically admissible bending moment diagram. What is the type of collapse.

b) Determine the value of plastic moment of the frame, when loaded up to collapse as shown in Fig. 2(b). The plastic moment of frame is uniform throughout. **[13]**

P.T.O.

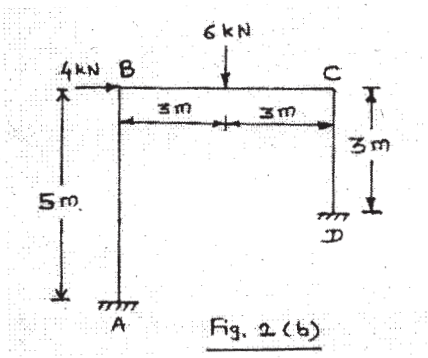

Fig. 2 (b)

Q3) A symmetrical gable portal frame ABCDE has bases A & E fixed 12m apart. Vertical column AB & ED each equal to 7m and apex C is 10m above the base. It is subjected to horizontal load 50 KN at B and a concentrated load 80 KN each at center of each gable beam. Mp is uniform. **[25]**

a) Draw (Sway + Gable) mechanism and obtain M_p.

b) Draw all basic mechanism and obtain M_p in each case.

SECTION-II

Q4) a) How the cross sections are classified in limit state theory? What is its significance? **[5]**

b) A simply supported beam of 8m effective span carrying a total factor load of 70 kN/m. The depth of beam should not exceed 600mm. The compression flange of the beam is laterally supported. Design the section as per IS: 800-2007 and check for shear and deflection. **[15]**

c) What are the requirements' of steel for the design of steel structure by limit state method? **[5]**

Q5) A column in a building is subjected to factored axial compressive load of 250 kN & factored bending moments of 60 kN.m & 45 kN.m at its top hinged end & bottom fixed end respectively. Both bending moments produce identical curvature about zz axis. Height of column is 5m & it is braced at its mid height to provide local lateral restraint for buckling about yy axis. The column belongs to non-sway frame. Design the section & use specifications for interaction between moment & axial compression as per IS: 800-2007. **[25]**

Q6) Design symmetrical gable portal frame for workshop shed of span 25m. Height of both columns is 10m and apex is at 12m from base. Column bases are fixed. AC sheet is used over purlins. Using (DL + LL) combination, design uniform section for bending as per IS: 800-2007. **[25]**

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Total No. of Questions : 6]

SEAT No. :

P3456

[Total No. of Pages : 2

[4660] - 64

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

DESIGN OF INDUSTRIAL STEEL STRUCTURES

(2008 Pattern) (Elective - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figure to the right indicates full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of cell phone is prohibited in the examination hall.***
7) ***Use of electronic pocket calculator, latest IS codes and steel table is allowed.***

SECTION - I

Q1) Analyses an industrial building bent with knee braced for the total horizontal load P due to wind by approximate method and determine the horizontal reaction vertical reaction and maximum bending moment for the following cases. **[25]**

Draw the bending moment diagram for each case.

a) Columns hinged at the base.

b) Columns fixed at the base, and

c) Columns partially fixed at the base.

Q2) a) Explain in details design of bracket supporting gantry loads. **[10]**

b) Explain in details analysis and design of gable portal frame with and without gantry loads with usual notation. **[15]**

P.T.O.

Q3) The span of knee braced roof trusses over an industrial building 28 m long is 18 m. The spacing of roof trusses is 4 m. The pitch of roof is 1 in 4. The galvanized corrugated iron sheet is used for roof covering. The basic wind pressure is 1.5 kN/m^2 and there is no snow fall. The height of eaves above ground level is 8.0 m. Propose a suitable type of roof truss. Determine the load at the various panel points due to dead load, live load and wind load. Also determine the reactions. **[25]**

SECTION - II

Q4) a) Explain in brief advantage and disadvantage mobile gantry girder. **[10]**

b) Explain in brief design requirement for the machine foundation. **[10]**

c) Explain in brief design of industrial flooring. **[5]**

Q5) a) Explain in brief the application of trussed purlin. **[5]**

b) Design a trussed purlin to carry a uniformly distributed load of 25 kN/m over a simply supported span of 10 m. Use equal double angles for chord and web members. Select suitable geometry for truss purlin and draw the cross section of the members. **[20]**

Q6) a) State the functional aspect of various bracing systems in an industrial shed structure. **[10]**

b) Explain design procedure bracing systems in an industrial shed structure in transverse and longitudinal plane. **[15]**

Total No. of Questions : 6]

SEAT No. :

P2762

[Total No. of Pages : 2

[4660]-65
M.E. (Civil-Structures)
THEORY OF PLATES AND SHELLS
(501408) (2008 Course) (Semester-II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Differentiate between the two dimensional plane stress and plane strain elasticity problems. **[5]**

b) What are the assumptions made in classical plate theory? Elaborate each assumption. **[5]**

c) Derive the governing differential equation in Cartesian coordinates for bending of rectangular thin plates.
Discuss the boundary conditions. **[15]**

Q2) a) Derive Navier's solution for deflection a simply supported rectangular plate under uniform intensity of loading q. **[16]**

b) A simply supported isotropic plate is subjected to uniform intensity of loading q. Apply Ritz's method to obtain the expression for deflected shape of the plate. **[9]**

Q3) A clamped circular plate of radius 'a' carries uniform loading of intensity q. Analyze the plate from basics principles and obtain the expressions for bending moments at the center of the plate. **[25]**

P.T.O.

SECTION-II

Q4) a) Derive the expressions for the strains in the shell at a point due to bending and membrane actions. **[18]**

b) What are the assumptions made in the general theory of thin elastic shells? Elaborate each assumption. **[7]**

Q5) a) Derive the equations of equilibrium for a small element of a cylindrical shell. Show the stress resultants on this element for general loading. **[15]**

b) Apply the above equations to obtain the expressions for membrane stresses N_X, N_φ and $N_{x\varphi}$ for a cantilever cylind rical open shell of length L, radius a, and half angle φ_0 subjected to self weight. **[10]**

Q6) a) Explain the need for the bending theory for the analysis of the shell structure. **[5]**

b) Describe in brief, the Lundgren's beam theory for this shells. **[5]**

c) Using Lundgren's beam theory, analyze a semicircular cylindrical shell of 4 m radius, simply supported over a span of 15 m, the shell thickness is 70 mm. It is subjected to uniformly distributed load, inclusive of the self weight of intensity 3 kN/m^2. Calculate the maximum compressive stress at the crown in the mid span section. **[15]**

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Total No. of Questions : 6]

SEAT No. :

P2763

[Total No. of Pages : 2

[4660]-66
M.E. (Civil Structures)
FINITE ELEMENT METHOD
(501409) (2008 Pattern) (Semester-II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Explain Pascal's pyramid and its use in selecting terms in displacement function polynomials for 3D tetrahedron element. **[8]**

b) Using potential energy approach derive stiffness matrix for a beam element. **[9]**

c) A bar element with axial displacement 'x' as degree of freedom at end nodes, derive [K] for element using Polynomial displacement function. **[8]**

Q2) a) Determine shape function for a CST element. Prove that the natural co-ordinates are nothing but are co-ordinates for CST element of 2D problem. **[12]**

b) State and explain 'Convergence Requirements of displacement function'. Examine whether the given displacement field for a plane stress rectangular element satisfy the convergence criteria. **[8]**

$u = a_0 + a_1x + a_2y + a_3xy$

$v = a_4 + a_5x + a_6y + a_7xy$

c) Compare CST element with LST element. **[5]**

P.T.O.

Q3) a) Using serendipity concept find shape functions for a 8 noded quadratic seredipity family element. **[10]**

b) What is derivative transformation? How is it carried out with the help of a Jacobian? Where is such a transformation required in FEM? **[9]**

c) State and explain the three basic laws on which isoparametric concept is developed. **[6]**

SECTION-II

Q4) a) For axisymmetric element write stress strain relations and hence obtain element stiffness matrix. **[10]**

b) Explain the method of finding shape function for a hexahedral element using natural coordinates. **[9]**

c) Explain axisymmetric element and what are the applications of axisymmetric elements? **[6]**

Q5) a) Explain Midlin's theory of plate bending. **[8]**

b) Write displacement functions for both ACM and BFS elements. Verify conformity of both the elements. **[17]**

Q6) a) Explain the concept of degenerated solid elements by suitable examples. Write displacement fields in 4 noded degenerated shell element. **[15]**

b) Explain with neat sketches the various three dimensional elements used in the analysis of shells. What are the factors to be considered in the development of shell elements? **[10]**

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Total No. of Questions : 6]

SEAT No. :

P3439

[Total No. of Pages : 2

[4660] - 67
M.E. (Civil) (Structures)
MANAGEMENT IN STRUCTURAL ENGINEERING
(2008 Pattern)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates :

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

SECTION - I

Q1) a) Why the classification of construction material is essential? State the factors affecting it and classify different construction materials. **[7]**

b) Explain time monitoring methodology. **[8]**

c) State and explain the factors affecting production efficiency. **[10]**

Q2) a) List different methods used to give fire protection. Explain any one method with advantages and disadvantages. **[9]**

b) Explain ultrasonic pulse velocity method. **[8]**

c) Explain the factors affecting durability of concrete. **[8]**

Q3) a) Describe: Structural audit of a structure. **[7]**

b) How the carbonation depth measurement test is carried out? **[8]**

c) Write short note on **[10]**

i) Factors affecting health of a structure.

ii) Tools for investigations of collapsed structure.

P.T.O.

SECTION - II

Q4) a) Differentiate between retrofitting, restoration and rehabilitation. **[5]**

b) Write the specifications for **[12]**

i) R.C.C. jacketing.

ii) Sealing of honeycombed areas with cement mortars.

iii) Shear wall.

c) Explain Base Isolation with neat sketch. **[8]**

Q5) a) Write short note on formwork material. **[7]**

b) Explain design of formwork with respect to load on form work, design criterion and design procedure. **[9]**

c) What are objectives of construction safety? Explain different methods adopted for safety. **[9]**

Q6) Write short note on : **[25]**

a) Planning and execution of demolition.

b) Recycling of demolition waste.

c) Role of structural drawings in demolition of structure.

d) Method of implosion.

e) Demolition plan.

Total No. of Questions : 12]

SEAT No. :

P3291

[Total No. of Pages : 3

[4660] - 68

M.E. (Civil) (Structure)

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(2008 Pattern)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt all questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of non programmable electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Use of IS 1893 (2002) Part - I is permitted.***

SECTION - I

Q1) a) What is an earthquake? Explain the causes and classification of earthquake based on different parameters? **[6]**

b) Explain the lessons learnt from past earthquakes? What is the philosophy behind earthquake resistant design of structure? **[6]**

c) Describe measurement of ground motion during earthquake? **[6]**

OR

Q2) a) Describe code based methods of seismic analysis? **[6]**

b) What is non-structures? Explain various approaches to deal with non-structures? **[6]**

c) Write a note on body waves and surface waves in an earthquake? **[6]**

P.T.O.

Q3) a) Describe with examples the effect of different irregularities in a structure in an earthquake prone area? **[8]**

b) What is soil liquefaction? What are the measures taken to reduce it. **[8]**

OR

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

a) Strong ground motion

b) Soil structure interaction

c) Plate tectonic theory

Q5) A single storey building has shear walls as shown in figure 5.1. The shear walls are of M25 grade concrete and 200 mm thick. The storey height is 4m. Design shear force on building is 500 kN in either direction. Compute design lateral force in Y - direction. **[16]**

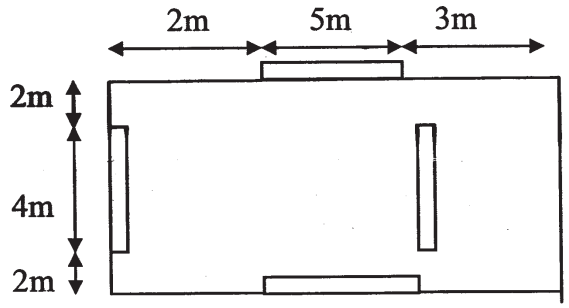

Figure 5.1

OR

Q6) The plan for four storey hospital building is shown in figure 6.1. Assuming SMRF construction and medium stiff soil, determine seismic loads in Y- direction on structure. Take D.L. = 10 kN/m^2, LL = 3 kN/m^2 and floor height 3.2 m. **[16]**

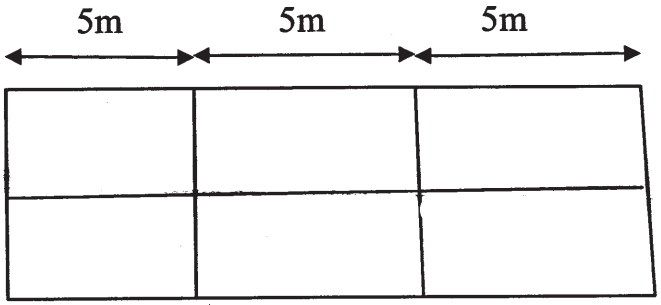

Figure 6.1

SECTION - II

Q7) a) Explain the causes of instability of steel building? Describe the P-Δ effect? **[8]**

b) Explain the procedure to carry dynamic analysis of multistory structure to obtain seismic forces and distribution along the height? **[10]**

OR

Q8) a) Give reasons for poor performance of masonry buildings? How to improve the seismic performance of masonry building? **[8]**

b) Describe the restoration of masonry buildings? **[10]**

Q9) Design a RC rectangular beam of span 6 m supported on RC columns to carry a point load of 150 kN in addition to its self weight 3 kN/m. The moment due to seismic load is 6 kN/m and shear force 30 kN. Use M20 grade concrete and Fe250 grade steel. **[16]**

OR

Q10) a) Define shear wall and their classification? Describe behavior of long shear wall? **[8]**

b) Discuss advantages and disadvantages of off different types of steel frames in building in earthquake prone area? **[8]**

Q11) a) What is necessity of ductile detailing? Explain with sketches ductile detailing of flexural member? **[8]**

b) Explain concept of base isolation? Describe different techniques of base isolations? **[8]**

OR

Q12) a) How would you carry the assessment of RC building to ascertain the requirement of level of retrofitting? **[8]**

b) Explain in detail the non-conventional techniques for retrofitting of RC building? **[8]**

Total No. of Questions : 8]

SEAT No. :

P3446

[Total No. of Pages : 2

[4660] - 7

M.E. (Civil) (Construction Management)

CONSTRUCTION SAFETY (Semester - I)

(2008 Pattern) (Elective - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:-

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

SECTION - I

Q1) What do you mean by construction safety management? Explain with an example organizational chart of construction safety management for higher, middle and lower level management. **[18]**

Q2) a) What are the responsibilities of general employees during construction of high rise building. **[8]**

b) Which are socio-economic causes of accidents? What are the effects and cost associated with accident? **[8]**

Q3) Write note on : **[16]**

a) safety checklist for erection of frames

b) incentives and monitoring

c) Writing safety manuals

d) Prevention of accidents

P.T.O.

Q4) With a case study, explain in detail safety of accident for tunnel at various stages of construction. What safety measures are to be taken into account especially before, during and after construction of tunnel? **[16]**

SECTION - II

Q5) a) What precautions are taken while operating with hoists and cranes? **[8]**

b) Explain safety measures adopted on site while working with scaffolding. **[8]**

Q6) a) Describe various safety equipments and gears used on site. **[8]**

b) What are legal requirement and cost factors associated with accidents on site? **[8]**

Q7) Write short notes on : **[16]**

a) Safety policies, methods and training in ISO certified Construction Company

b) Group insurance policy for labours

Q8) Give the first aid to be given in case of the following accidents and also explain precautions to be taken : **[18]**

a) Head hit by hammer

b) Shock at short circuiting

c) Skin burnt during welding

d) Leg cramp while loading / unloading

e) Body pain during concreting

f) Psychological effects due to noise

Total No. of Questions : 8]

SEAT No. :

P2764

[Total No. of Pages : 3

[4660]-70
M.E. (Civil) (Engineering)
c-STRUCTURAL RELIABILITY
(2008 Pattern) (Elective-III) (Semester-II) (Theory) (501411)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Enlist common probability distributions used in reliability analysis and explain any one of them in detail. **[6]**

b) Samples of soil are collected from various depths below ground level and tested in the laboratory to determine their shear strength. The collected field data are given below: **[6]**

Depth (m)	2	3	4	5	6	7
Shear strength (KN/m^2)	14.8	20.3	32.2	39.0	42.0	56.4

Determine the sample covariance and correlation coefficient between the depth of the soil and its shear strength. What do you infer?

c) Enlist common probability Distributions used in reliability analysis and explain any one of them in detail. **[5]**

Q2) a) State and review critically the principal advantages of probability based Limit State Design Method over the deterministic methods of design of Civil Engineering Structures. **[6]**

b) From the statistical analysis of live load survey, it is found that live load follows the lognormal distribution with parameters_____. **[5]**

Median of live load = 1217 N/m^2

Standard deviation of live load = 0.368

P.T.O.

Determine the characteristic load for the probability of live load exceeding lifetime maximum live load being 0.05, if there is no change in tenancy during the lifetime of the building.

c) Define the term 'Structural Reliability' with explanation of each significant element in that definition. **[5]**

Q3) a) Derive the expressions for the reliability of a series system and a parallel redundant system. **[6]**

b) Derive the expression for 'Reliability Index' for the case of load (S) and resistance (R) following normal distribution. **[6]**

c) The axial load carrying capacity of a column R, is normally distributed with mean valve and standard deviation of R being 100 KN and 200 KN respectively. The column is subjected to an axial load, S, which is normally distributed with mean valve and standard deviation of S being 700 KN and 300 KN respectively. **[5]**

Q4) a) Explain the formulation of probability model for wind load along with the various variables involved. **[6]**

b) It is given that he ratio of the mean value of the cube strength of M15 Concrete (design mix) to its characteristic strength is 1.4 and the coefficient of variation of the strength of concrete is 0.18. Determine the allowable stress for the probability of failure of concrete equal to 0.001 and coefficient K value equal to (–3.091) for the given probability. **[5]**

c) What is meant by the Lifetime Maximum Sustained Load? Enumerate the assumptions used in the stochastic analysis of it. **[5]**

SECTION-II

Q5) a) Explain the Inverse Transformation Technique and derive expression for generating random deviates of y having Uniform Distribution. **[6]**

b) Write note on Applications of Monte Carlo Method. **[6]**

c) Explain the procedure stepwise to generate normal vitiates from the distribution of Y following the normal distribution with mean u and variance s^2. **[5]**

Q6) a) Explain Monte Carlo Method with respect to its objective and procedural steps? **[6]**

b) What is meant by Safety Checking Formats for a design code? Explain in brief CEB & LRFD formats. **[5]**

c) Explain how the system reliability concept can be extended for decision making with design risk. **[5]**

Q7) a) Explain stepwise procedure to determine partial safety factors for the given reliability index. **[6]**

b) Explain in brief the steps involved in the development of reliability based design criteria. **[6]**

c) Write short note on Reliability based design criteria for RCC beams in limit state of collapse calibrated in IS code. Comment on the observations and conclusion on safety factors. **[5]**

Q8) a) Write short note on Reliability based Design Analysis Techniques. **[6]**

b) Explain the steps to formulate Reliability Based Decision Model for designed risk. **[5]**

c) Comment on the Reliability Based Managerial decision Tree Technique as an efficient managerial tool. **[5]**

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Total No. of Questions : 6]

SEAT No. :

P2765

[Total No. of Pages : 2

[4660]-71
M.E. (Civil-Structures)
d-NON-LINEAR ANALYSIS OF STRUCTURES
(501411) (2008 Course) (Elective-III) (Semester-II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) State and explain techniques of non-linear analysis. **[6]**

b) Find approximate solution for a moment-slope non linear analysis of a cantilever beam with point load at the free end. Plot load-deflection curves. **[13]**

c) State and explain types of nonlinearities, with examples, in the analysis of structure. **[6]**

Q2) a) Explain 'Displacement Equations Approach' of nonlinear analysis of plates. **[8]**

b) Write the strain energies due to stretching, bending and kinetic energy of an orthotropic plate. Use Hamilton's principle and stress function approach to derive governing equations. **[17]**

Q3) a) State a system of four equations governing the large amplitude flexural vibrations of anisotropic plates. **[10]**

b) Derive the simplified nonlinear governing equation using Berger approximation for plates with immovable boundaries. **[15]**

P.T.O.

SECTION-II

Q4) Obtain approximate solutions for the tip deflection components of cantilever column at post-buckling stage due non linear behaviour considering moment curvature relationship. **[25]**

Q5) a) Explain with diagrams and derivation, the deformation of square pinned-fixed frame for compressive loading. **[15]**

b) For a two-node truss element, develop the tangent stiffness matrix and force vector corresponding to the configuration at time t. Consider large displacement and large strain conditions. **[10]**

Q6) a) Obtain the displacement transformation matrix for a member with a hinge. **[12]**

b) Write procedure for elastic plastic analysis of **[13]**

i) Frames.

ii) Propped cantilever.

●●●●●

Total No. of Questions : 6]

SEAT No. :

P3467

[Total No. of Pages :2

[4660] - 72
M.E. (Civil-Structures)
BIO MECHANICS AND BIO MATERIALS
(2008 Pattern) (Open Elective -IV) (Semester - II)

Time : 4 Hours] *[Maximum Marks :100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain soft tissue and Hard tissue with suitable illustration. Explain engineering properties of hard tissue. **[8]**

b) Explain various elastic models applicable to soft tissue and hard tissue. Draw suitable diagram to illustrate. **[9]**

c) Enlist and Explain applications of study of human Biomechanics. **[8]**

Q2) a) Explain material bio compatibility and list bio compatible materials used widely in treating human illnesses. Illustrate your answer with suitable application. **[8]**

b) Explain various non metallic materials used as bio compatible materials with its Advantages and application. **[9]**

c) Explain use of ceramics as replacement components/artificial fixation devices **[8]**

Q3) a) Explain bone cement, PMMA. Explain its advantage as biomaterial. **[8]**

b) Explain silicon rubber, UHMWPE, ultra high molecular weight poly ethylene as biocompatible material. **[9]**

c) Explain properties of stainless steel, cobalt base alloys, Titanium base alloys when used as prosthesis material. **[8]**

P.T.O.

SECTION - II

Q4) a) Explain in brief anisotropy, transverse isotropy, orthotropy for bone tissue. **[9]**

b) Explain geometry of the articulating joint for ankle joint, Knee joint, Hip joint. Show joint forces acting on each. **[9]**

c) Explain device to measure wear of cartilage on cartilage material. **[7]**

Q5) a) Explain the term gait analysis. **[8]**

b) Enlist and explain various measurement techniques for body motion **[9]**

c) How gait analysis helps in various applications of Biomechanics study **[8]**

Q6) a) What are the fundamental design consideration for engineering design of prosthesis. **[8]**

b) Explain step by step structural design cycle of a fixation device in biological environment. **[9]**

c) What is the classification of prosthetics devices. Enlist prosthetics widely used and the situations in which they are required to be used. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P2766

[Total No. of Pages :2

[4660] - 73
ME (Civil Structure)
b :MECHANICS OF MODERN MATERIALS
(2008 Pattern) (Elective - IV Open) (501412) (Semester - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain various fibers and matrices used in FRPC (fiber reinforced {polymer Composite) **[8]**

b) What do you understand by Piezoelectric material? What is direct and converse effect, Explain engineering applications of piezoelectric materials? **[9]**

c) Explain material classification used in FRC. **[8]**

Q2) a) Write generalized Hooke's law for an orthotropic material in 1-2-3 coordinate system. **[8]**

b) Explain elastic behavior of anisotropic material. **[8]**

c) Write compliance and stiffness matrices for plane stress condition for isotropic material. **[9]**

Q3) a) Explain theories of failure applicable for FRC. **[12]**

b) Explain stress train behavior of FRC. **[13]**

P.T.O.

SECTION - II

Q4) a) Obtain Naviers equation for orthotropic laminate with two opposite side simply supported. **[9]**

b) Explain **[16]**

i) Orthotropic, Anisotropic laminate

ii) Symmetric, balanced laminate

iii) Antisymmetric and cross ply laminate

Q5) a) Explain factors affecting mechanical properties of composite laminate. **[10]**

b) Find coefficient of thermal expansion for a 90 degree ply laminate **[15]**

$E_1 = 150$ GPa, $E_2 = 14$ GPa, $E_3 = 14$ GPA

$\mu_{12} = 0.29 = \mu_{21}$

$\alpha_1 = 0.9*10^{-6}\ /c^0$, $\alpha_2 = 27*10^{-6}\ /c^0$

Q6) a) Explain how fiber reinforced composite is manufactured. **[8]**

b) Explain in detail various tests carried out to test engineering performance of composite. **[9]**

c) Explain high performance composite material with its applications. **[8]**

Total No. of Questions : 6]

SEAT No. :

P2767

[Total No. of Pages :2

[4660] - 74
ME (Civil - Structures)
c : THEORY OF PLASTICITY
(2008 Course) (Semester - II) (Open Elective - IV) (501412)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Derive the strain displacement relationship for 3D elasticity problems. **[8]**

b) Derive the compatibility equation in-terms of stresses for plane strain problem. **[6]**

c) Explain with examples plane stress and plane strain problems. **[6]**

d) Explain in brief constitutive relations for isotropic bodies. **[5]**

Q2) a) Describe geometrical representation of the yield surface in the principle stress space. **[10]**

b) Where does normality rule came from. **[5]**

c) Write short note on yield surfaces. **[5]**

d) Write short note on convexity of yield surface. **[5]**

Q3) a) Explain factors affecting plastic deformations of metals. **[5]**

b) What is meant by "the direction of plastic flow", How is the plastic flow direction determined? **[10]**

c) Explain in brief Drucker's stability postulates. **[10]**

P.T.O.

SECTION - II

Q4) a) What is isotropic and kinematic hardening. **[10]**

b) Explain initial and subsequent yield surface in tension. **[10]**

c) What is the Mises flow rule for isotropic hardening? **[5]**

Q5) a) Derive the shape factor for bending of wide plate. **[15]**

b) Determine the plastic deformation of the bar if the whole elongation $\Delta l = 0.03m$, the original length of the bar was $l = 4.0\ m$, assumption is elasto-plastic behaviour of material. E = 210 GPa and $f_y = 275$ MPa. **[10]**

Q6) a) State the convergence criteria of displacement function in finite element analysis. **[10]**

b) State the theorems of isotropic formulation. **[5]**

c) State and explain theorems of limit analysis. **[10]**

Total No. of Questions : 6]

SEAT No. :

P3488

[Total No. of Pages : 3

[4660] - 75
M.E. (Civil) (Structures)
OPTIMIZATION TECHNIQUES
(2008 Pattern) (Elective - IV)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any two question from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) State engineering applications of optimization and explain mathematical statement of optimization problem. **[6]**

b) To design uniform column of rectangular cross section to avioid failure due to direct compression and buckling, formulate on optimization problem to minimize the mass of column for economy. Assume the permissible compressive stress to be σ_{max}. **[12]**

c) Find the maxima and minima of the function. **[7]**

$$f(x) = 12x^5 - 45x^4 + 40x^3 + 5$$

Q2) a) How to identify the optimum solution in the simplex mehod? **[6]**

b) Minimize the following function with linear programming **[10]**

$$f(x_1, x_2) = 3x_1 - 5x_2$$

Subject to

$$x_1 + x_2 \leq -2$$
$$4x_1 + x_2 \geq -5$$
$$x_1 \geq 0, x_2 - \text{un restricted in sign.}$$

P.T.O.

c) Maximize **[9]**

$$F = 2x_1 + x_2 + 3x_3$$

Subject to

$$x_1 + x_2 + 2x_3 \leq 5$$
$$2x_1 + 3x_2 + 4x_1 = 12$$
$$x_1, x_2, x_3 \geq 0$$

Q3) a) Find the value of x in the interval (0, 1) which minimizes the function $f = x^3 - 10x - 2x^2 + 10$ to within ± 0.05 by Fibonacci method. **[12]**

b) Perform two-iterations of the cubic search method to minimize the function. **[13]**

$$f(x) = (x^2 - 1)^3 - (2x - 5)^4$$

SECTION - II

Q4) a) Minimize $f = 2\left(x_2 - x_1^2\right)^2 + \left(1 - x_1\right)^2$ If a base simplex is defined by the

Vertices $X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$. $X_2 = \begin{Bmatrix} 1 \\ 0 \end{Bmatrix}$, $X_3 = \begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$ **[13]**

Find a sequence of four improved vectors using reflection, expansion and / or contraction.

b) Carry out first three iterations for minimization of the following problem using steepest descent method. Assume $X_0 = 0$.

$$f(X) = x_1 - x_2 + x_1^2 - x_1 x_2.$$ **[12]**

Q5) a) Complete one iteration of the reduced gradient technique for the following NLP problem **[13]**

Minimize $x_1^2 + x_2^2$

Subject to $x_1 x_2 - 9 = 0$

Use a starting fensible solution $X_0 = \begin{Bmatrix} 2.0 \\ 4.5 \end{Bmatrix}$

b) Minimize $f = x^2 - 2x - 1$

Subject to $g_1 = -x + 1 \geq 0$

Use the interior penalty function method. **[12]**

Q6) a) Illustrate the difference between Genetic Algorithms and traditional methods of optimization. Explain the way of representation of design variables in GA's. **[13]**

b) What is a neural network? How is a neuron modeled in neural network based models? **[12]**

Total No. of Questions : 6]

SEAT No. :

P3246

[Total No. of Pages : 4

[4660] - 76
M.E (Civil) (Environmental Engg.)
NUMERICAL METHODS & APPLIED STATISTICS
(2008 Course) (Semester - I) (501501)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Find the roots of the equation $x^2 - y^2 + 1 = 0$ and $2xy = 0$. **[8]**

b) Solve the following system of equations using Gauss Elimination method. **[12]**

$$5x_1 - 2x_2 + x_3 - 3x_4 = -8$$

$$x_1 - 10x_2 - 2x_3 - x_4 = -29$$

$$3x_1 - 3x_2 + 10x_3 + x_4 = 31$$

$$2x_1 + x_2 - 3x_3 + 5x_4 = 15$$

c) Find the interpolating polynomial passing through the points. **[5]**

x :	0	1	2	3
y :	2	3	12	147

P.T.O.

Q2) a) A firm plans to purchase atleast 200 quintals of scrap containing high quality metal 'X' and low quality metal 'Y'. It is decided that the scrap to be purchased must contain atleast 100 quintals of metal 'X' and more than 35 quintals of metal '*Y*'. The firm can purchase the scrap from two suppliers A & B in unlimited quantities. The percentage X and Y metals in terms of weight in the scrap supplied by A & B are given below:

Metals	Supplier A	Supplier B
x	25%	75%
y	10%	20%

The price of A's scrap is Rs. 200 per quintals and that of 'B' is Rs. 400 per quintal. The firm wants to determine the quantities that it should buy from the two suppliers so that total cost is minimized. **[10]**

b) Minimize $Z = x_1 - 3x_2 + 3x_3$ using simplex method subject to **[15]**

$3x_1 - x_2 + 2x_3 \leq 7$, $\quad 2x_1 + 4x_2 \geq -12$,

$-4x_1 + 3x_2 + 8x_3 \leq 10$, $\quad x_1, x_2, x_3 \geq 0$.

Q3) a) Compute coefficient of skewness and kurtosis based on the following data. **[9]**

x :	4.5	14.5	24.5	34.5	44.5	54.5
f :	1	5	12	22	17	9

b) i) Establish a relation between moments about arbitrary origin and central moments.

ii) The first four moments about a distribution about $x = 2$ are 1, 2.5, 5.5 and 16.

Calculate first four moments about $\bar{x}$ and about 'zero'. **[8]**

c) A manufacturing firm produces pipes in three plants with daily production volumes of 500, 1000 & 2000 units respectively. **[8]**
According to past experience, it is known that fraction of defective outputs produced by three plants are respectively 0.005, 0.008, 0.010. If pipe is selected from a day's total production and found to be defective.

i) Find from which plant the pipe comes?

ii) What is the probability that it came from the first plant.

SECTION - II

Q4) a) The following data shows the no. of seeds germinating out of 10 on a damp filter for 80 set of seeds. Fit a binomial distribution for the data. Also calculate theoretical frequencies. **[10]**

X	:	0	1	2	3	4	5	6	7	8	9	10
Y	:	6	20	28	12	8	0	0	0	0	0	0

b) State and explain characteristics of normal distribution. **[8]**

c) The fraction of a pollutant 'A' and fraction of a pollutant 'B' emitted from a source are described the joint density function **[7]**

$f(xy) = 8xy,\ 0 \le y \le x \le 1$

$= 0$ else where.

Find covariance of X and Y.

Given Marginal density functions as

$g(x) = 4x^3\ 0 \le x \le 1$

0 else where

& $h(y) = 4y(1-y^2)\quad 0 \le y \le 1$

0 else where.

Q5) a) Write short note on <u>any two</u> of the following **[10]**

i) Characteristics of Good Estimator.

ii) Tests of significance for attributes.

iii) Chi-square Distribution.

b) The table below represents a production of an item in a factory. **[8]**

Year :	1997	1998	1999	2000	2001	2002	2003
Production: (Per quintal)	77	88	94	85	91	98	90

Fit a straight line for the above data by method of least squares.

c) A random sample of size '16' has 53 as mean. The sum of squares of deviation taken from mean is 135. Can this sample be regarded as taken from the population having 56 as mean. Obtain 95% and 99% confidence limits of the mean of the population. (for $v = 15$, $t_{0.05} = 2.13$, $t_{0.01} = 2.95$). **[7]**

Q6) a) Calculate coefficient of correlation between age and playing habits from the data given below. Also calculate probable error? **[9]**

Age :	20	21	22	23	24	25
No.of students :	500	400	300	240	200	160
Regular players :	400	300	180	96	60	24

b) Calculate regression equation of X on Y and Y on X from the following data. **[8]**

X	:	10	12	13	17	18	20	24	30
Y	:	5	6	7	9	13	15	20	21

c) Discuss components of time series analysis. **[8]**

Total No. of Questions : 8]

SEAT No. :

P3432

[Total No. of Pages : 2

[4660] - 78

M.E. (Civil) (Environmental Engineering)

PHYSICO-CHEMICAL PROCESS FOR WATER AND WASTE WATER TREATMENT

(2010 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Explain the Importance of drinking water quality criteria and discuss its importance in the design of water quality standards. **[18]**

Q2) a) Explain Langlier Index with significance. **[8]**

b) Explain the mass balance principle. Also state the assumptions made in mass balance analysis. **[8]**

Q3) Discuss the process of sedimentation with coagulation for water treatment plants. Also explain the factors affecting coagulation, list of commonly used coagulents with their merit & limitations. **[16]**

Q4) a) Discuss the double layer theory of particle destabilization. **[8]**

b) Sketch and explain the relationship between backwash velocity and build up of head loss during back washing. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain the mechanism of organic matter removal in trickling filters. **[8]**

b) Discuss the relationship between activated sludge settleability and seperating food to microorganism ratio for various type of activated sludge process. **[8]**

Q6) Explain the principle of suspended growth and attached growth process for wastewater treatment. Discuss the various operational problems commonly encountered in activated sludge treatment plants and discuss suitable remedial measures for the same. **[16]**

Q7) a) Describe the characterstics of a good disinfectant. **[8]**

b) Classify methods of disinfection. Compare and contrast these methods. **[8]**

Q8) Write short note on ANY THREE : **[3 × 6 = 18]**

a) Nano filtration

b) Electrodyalisis

c) Ion Exchange Process

d) Break point chlorination with figures, its advantages.

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Total No. of Questions : 8]

SEAT No. :

P3445

[Total No. of Pages : 2

[4660] - 79

M.E. (Civil) (Environmental Engineering)

AIR AND WATER QUALITY MODELING

(2010 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:-

1) ***Answer any three questions from each section.***
2) ***Use of non-programmable calculators are allowed.***
3) ***Neat sketches to be drawn wherever necessary.***
4) ***Make suitable assumptions if necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the importance of model building and write the steps in the model development. **[8]**

b) Explain the equillibrium principle. **[8]**

Q2) a) What are different water quality models? Explain any one model with its assumptions and reliability. **[8]**

b) Discuss the modifications to streeter-phelps equation. **[8]**

Q3) a) Explain advection, diffusion and dispersion with respect to transport of pollutant. **[8]**

b) Discuss about ground water quality modeling. **[8]**

P.T.O.

Q4) Write short notes on following : **[3 × 6 = 18]**

a) Nitrogen model in a lake

b) National AQI

c) Combined Water Quality Index

SECTION - II

Q5) a) Discuss the various methods for assessing the performance of the air quality model. **[8]**

b) Discuss the multiple cell model. **[8]**

Q6) a) Explain how would you calculate the air quality index. **[8]**

b) Discuss the importance of quality index in the modelling studies. **[8]**

Q7) a) Discuss the plume behaviour and explain its special features. **[8]**

b) Derive Gaussian plume equation stating the assumption made. **[8]**

Q8) Write a short notes on following : **[3 × 6 = 18]**

a) Calibration and verification of model

b) Lake water quality model

c) Effect of velocity and topography on transport of pollutants.

Total No. of Questions : 8]

SEAT No. :

P3475

[Total No. of Pages : 2

[4660]-8
M.E. (Civil - Construction & Management)
RESOURCES MANAGEMENT
(2008 Pattern) (Semester - I) (Elective - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Question Nos 1 & 5 are compulsory. Out of remaining attempt any two questions.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of Calculator is allowed.***
7) ***Assume suitable data if necessary.***

SECTION - I
(Materials Management)

Q1) a) Discuss the role of Materials Manager in Construction Industry. Also explain in brief the objectives & functions of a Materials management in Construction Industry. **[10]**

b) Discuss in details the Integrated approach to materials management. **[8]**

Q2) a) Explain in details Materials Requirement planning. **[8]**

b) Discuss in brief EOO. Explain its importance in Materials Management. **[8]**

Q3) a) Write a note on Conventional methods of Quality control of Construction materials. **[8]**

b) Discuss use of Materials Management Systems (MMS) in materials planning. **[8]**

Q4) Write short notes on (Any four): **[16]**

a) Quality management
b) Vendor analysis
c) Safety stock
d) Site layout for stores management
e) JIT in Construction sector
f) Inventory Conrol Techniques

P.T.O.

SECTION - II

(Human Resources Management & Equipment Management)

Q5) a) Explain the importance of training in Construction Industry. Discuss different types of training. **[10]**

b) List out various equipments required for completion of earthwork for National Highway project. Explain their functions. List out the factors affecting the output of these equipments. **[8]**

Q6) a) Discuss in brief factors affecting Equipment Selection. **[8]**

b) Explain different types of compactors and factors affecting their selection. **[8]**

Q7) a) Enlist methods to calculate depreciation of construction Equipments. Explain any two methods in brief. **[8]**

b) Enumerate all elements of Equipment cost and describe in brief methods of estimating these. **[8]**

Q8) Write short notes on (Any four): **[16]**

a) Record Keeping in case of construction equipments

b) Training & Selection of manpower

c) Equipment Planning

d) OLDES programme of CIDC

Total No. of Questions : 8]

SEAT No. :

P3247

[Total No. of Pages : 2

[4660]-80

M.E. (Civil) (Environmental Engineering)

b-ENVIRONMENTAL LEGISLATION AND MANAGEMENT SYSTEM

(501504) (2010 Course) (Elective-I) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION-I

Q1) a) Write a note on Polluter Pays Principle. **[8]**

b) Write a note on Montreal Protocol. **[8]**

Q2) a) Explain penalties for violation of consent conditions under Water Act 1974. **[8]**

b) Write provisions for closure or directions in apprehended pollution situation. **[8]**

Q3) a) Write penalties for violation of consent conditions under Air Act 1981. **[8]**

b) Explain the provision relating to prevention and control in Air Act 1981. **[8]**

Q4) Write short note on: **[18]**

a) Kyoto agreement.

b) Concept of absolute liability.

c) Multilateral environmental agreements and Protocols.

P.T.O.

SECTION-II

Q5) a) Write objectives of Environmental Protection Agency (EPA) and explain its applications. **[8]**

b) Explain citing criteria for industries. **[8]**

Q6) a) Explain background and development of ISO 14000. **[8]**

b) Write objectives and application of ISO 14000. **[8]**

Q7) a) Write a note on Hazardous waste (Management and Handling) Rules, 1989. **[8]**

b) Write powers and functions of the MPCB board under air act. **[8]**

Q8) a) Write the responsibilities of waste generators and the role of Pollution Control Boards under Hazardous Waste rules. **[9]**

b) Explain the provisions related to environmental issues in Indian Forest Act. **[9]**

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Total No. of Questions : 10]

SEAT No. :

P2769

[Total No. of Pages :2

[4660] - 82
ME (Civil -Environmental Engg.)
(c) ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT
(2008 Course) (Semester - I) (Elective - I) (501504)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Figures to the right indicate full marks.***
3) ***Your answers will be valued as a whole.***
4) ***Assume Suitable data if necessary.***

SECTION - I

Q1) Explain the concept of EIA and its methodologies. **[18]**

Q2) Give note on **[16]**

a) Base line study

b) Mitigation and Matrices

Q3) Write in details for **[16]**

a) Network methodologies

b) Life cycle assessment

Q4) a) How you will identify the type and quantity of air pollutant? Explain with suitable example. **[9]**

b) Give air quality standards set by governing body in India. **[7]**

Q5) a) How you will predict the noise levels. Explain with suitable example. **[8]**

b) Explain how the noise impact assessment will be carried out. **[8]**

P.T.O.

SECTION - II

Q6) a) Explain how the water quality impact assessment will be carried out. **[9]**

b) What are the ground and surface water quality standards set by Governing agency in India. **[9]**

Q7) Explain in brief with suitable example about **[16]**

a) Rules and regulations for cultural resources.

b) Resettlement and rehabilitation.

Q8) a) What are the provisions made in EIA notification by ministry of Environment and Forest. Discuss in brief. **[10]**

b) What you understand by the categorization of industries. Explain. **[6]**

Q9) Give note on **[16]**

a) Comprehensive Environmental impact assessment

b) EIA document

Q10) With suitable example explain environmental management plan and post environmental monitoring. **[16]**

Total No. of Questions : 8]

SEAT No. :

P2770

[Total No. of Pages :2

[4660] - 83
M.E. (Civil -Environmental Engg.)
a - OCCUPATIONAL SAFETY & HEALTH
(2008 Course) (2010 Course) (Semester - I)(Elective - II) (501505)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the rights to know laws related to occupational safety and health? Explain. **[8]**

b) Explain the important provisions made in Occupational Safety and Health Act. **[8]**

Q2) a) What is heat stress? What are the effects of heat stress on human body? **[8]**

b) Explain ergonomics program. **[8]**

Q3) a) How to control hazards in dying industry? **[8]**

b) Explain Human error and fault tree analysis. **[8]**

Q4) Write short notes on following: **[18]**

a) Occupational safety and health act.

b) Task analysis.

c) Needs of ergonomics.

SECTION - II

Q5) a) Explain Electrical Safety with respect to fire prevention & protection. **[8]**

b) Explain fire development and its severity. **[8]**

P.T.O.

Q6) a) Discuss investigation methods & different models with respect to accidents in an industrial working environment. **[8]**

b) Discuss about control of accidents at construction site. **[8]**

Q7) a) What are the health problems in dying industries? **[8]**

b) How to mitigate health problems in food industry? **[8]**

Q8) Write short notes on following: **[18]**

a) Personal Protective Equipments for safety.

b) Occupational health & safety considerations in an industry.

c) Extinguishing fire.

Total No. of Questions : 8]

SEAT No. :

P2771

[Total No. of Pages :2

[4660] - 84
ME (Civil -Environmental Engg.)
(b) PRINCIPLES AND DESIGN OF BIOLOGICAL TREATMENT SYSTEM
(2008 Course) (Elective - II) (Semester - I) (501505)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator Log tables and electronic calculators is allowed.***
5) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Explain Objectives and significance of Biological treatment. **[7]**

b) Explain kinetic of Biological Growth. What the factors affecting to it? **[10]**

Q2) Give note on **[16]**

a) Attached and Suspended growth

b) Biodegradability Assessment

Q3) a) Discuss and explain the factors affecting the choice of reactors. **[10]**

b) Discuss about Biological characteristics of wastewater. **[7]**

Q4) a) For a wastewater inflow of 9000 m^3/day proposed to be treated in primary settling tank of not more than 2.25 hours detention time. Estimate the surface loading rate permissible for use. Assume side water depth of tank = 3 m. **[10]**

b) Give explanatory note on Flow measurement. **[7]**

P.T.O.

SECTION - II

Q5) a) Give notes on following: **[14]**

i) Trickling Filters

ii) S.B.R.

iii) Stabilization pond

b) Give the Eckenfelder's equation **[3]**

Q6) a) Explain in detail with sketch Expanded Granular Sludge Bed (EGSB) **[7]**

b) Design a gravity thickener for a wastewater treatment plant having primary and waste activated sludge with the following characteristics. **[10]**

Type of sludge	Specific Gravity	Solids in Percentage	Flow Rate (M^3/day)
Average Design conditions			
Primary Sludge	1.03	3.3	400
Waste Activated	1.005	0.2	2250
Peak Design conditions			
Primary Sludge	1.03	3.4	420
Waste Activated	1.005	0.23	2500

Q7) a) Give note on Disposal of Digested sludge. **[4+4+4+4 = 16]**

b) Explain about working of septic tank.

c) Give note on Anaerobic Filters.

d) Trickling filters.

Q8) a) Explain with any one case study on sludge management facilities. **[9+8]**

b) Explain with suitable example the trouble shooting.

Total No. of Questions : 8]

SEAT No. :

P3455

[Total No. of Pages : 2

[4660] - 85

M.E.(Civil) (Environmental Engineering)

ENVIRONMENTAL RISK ASSESSMENT & MANAGEMENT

(2010 Pattern) (Elective - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer ANY THREE questions from EACH section.***
2) ***Use of non programmable calculators are allowed.***
3) ***Neat sketches to be drawn wherever necessary.***
4) ***Make suitable assumption if necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) A risk Assessment is to be performed for a proposed hazardous waste incinerator site. Briefly describe the specific factors that should be considered in each of the four steps. **[10]**

b) Explain in terms an ordinary citizen could understand. What is meant by

i) One in Millian risks

ii) Acceptable risk

[6]

Q2) Discuss the role of EIA to minimize environmental risks and hazards due to thermal power plants. **[18]**

Q3) a) Discuss the main routes of exposures by which the organism can be exposed to chemical substances present in the environment. **[8]**

b) Explain the difference between a hazard index and cancer risk. **[8]**

P.T.O.

Q4) a) What do you understand by risk assessment and risk management? Explain the difference between total risk and incremental risk. **[8]**

b) Explain the hazard identification system. **[8]**

SECTION - II

Q5) Discuss how would you design a risk management programme. Explain with suitable examples. **[16]**

Q6) a) Discuss about the estimation of carcinogenic and non-carcinogenic risks to human health. **[8]**

b) Explain the different components of hazard and risk analysis. **[8]**

Q7) The drinking water contains 1.0 mg/lit of toluene and 0.01 mg/lit of tetrachloroethylene (C_2Cl_4). An adult having weight of 75 kg consumes the water @ 2.5 LPD for 12 year. **[18]**

a) Would the hazard index suggest that this was a safe level of exposure?

b) Tetrachloroethylene is a B_2 carcinogen. What would be the carcinogenic risk faced by someone drinking this water?

The reference dose (RfD) for toluene and tetrachloroethylene are as under

RfD (toluene) = 0.200 mg/kg-day

RfD (Tetrachloroethylene) = 0.01 mg/kg-day

The potency factor for oral intake of tetrachloroethylene is 5.1×10^{-2} $(mg/kg\text{-}day)^{-1}$.

Q8) Write short note on risk assessment & management for : **[2 × 8 = 16]**

a) Hazardous chemical storage

b) Hazardous waste disposal facilities.

Total No. of Questions : 8]

SEAT No. :

P3292

[Total No. of Pages : 3

[4660] - 86

M.E.(Civil) (Environmental Engineering)

INDUSTRIAL WASTE WATER MANAGEMENT

(2010 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain how would you manage the industrial wastewater using the concept of Industrial ecology. **[8]**

b) Discuss the volume and waste reduction approach for industrial water pollution control. **[8]**

Q2) a) Discuss the importance of equalization and Neutralization tanks for industrial wastewater treatment. **[8]**

b) Discuss the use of activated carbon for the removal of refractory organics from industrial wastewater. **[8]**

P.T.O.

Q3) a) Explain the biological nitrification denitrification process in details. **[8]**

b) Discuss the process of oil separation by flotation techniques. **[8]**

Q4) a) Define adsorption isotherm. Explain the steps involved in developing an adsorption isotherm. **[8]**

b) Determine : **[10]**

i) EBCT

ii) GAC usage rate

iii) Mass of GAC required

iv) Volume of water treated

v) Bed life and

vi) Specific throughput using the following data :

Volume of GAC in contactor = 12 m^3, volumetric flow rate = 1200 L/min, Initial concentration of TCE = 1.25 mg/L, Final concentration of TCE = 0.0025 mg/L, GAC density = 450 g/L, Freundlich capacity factor = 25 (mg/g) (L.mg) l/n, and Freund intensity parameter = 0.60.

SECTION - II

Q5) Explain the manufacturing process, characteristics and sources of wastewater generation for : **[3 × 6 = 18]**

a) Sugar Industry

b) Textile Industry

c) Food Processing Industry

Q6) Discuss the treatment options for wastewater from : **[2 × 8 = 16]**

a) Textile Industry

b) Tannery Industry

Q7) Write a short note on any three : **[3 × 6 = 18]**

a) Concept of cleaner technology

b) Water quality index

c) Waste water from Atomic energy plants

d) Water requirements for fertilizer industry

Q8) Explain the importance of Common Effluent Treatment Plants (CETP) for management of Industrial waste water.

Discuss the basic issues and principles involved in the design of CETP for heterogenous industrial estates. **[16]**

Total No. of Questions : 10]

SEAT No. :

P2772

[Total No. of Pages :2

[4660] - 87
M.E. (Civil -Environmental Engg.)
ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY
(2008 Course) (501509) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Explain the importance of Electrical Conductivity, Different types of solids and pH of the waste water in the wastewater treatment and management with suitable example. **[10]**

b) How knowledge of Colloidal Chemistry and nuclear Chemistry applied to the measurement of pollution parameters. **[8]**

Q2) a) Explain the principal and mechanism of optical methods in the pollutant removal in the industrial effluent with their advantages and disadvantages. **[8]**

b) Explain the nature of nuclear radiation, its impact of human health and uses of isotopes and tracers widely used in environmental engineering?**[8]**

Q3) a) Explain the principle of Atomic Absorption Spectrophotometer (AAS) with sketch and discuss its working, merits and demerits? **[8]**

b) Explain in detail High Performance Liquid Chromatography and give its limitations. How this limitation been overcome by Gas Chromatography? **[8]**

Q4) Discuss the selectivity of mobile phase in Gas Chromatography as well as HPLC in the wastewater treatment and analysis? Also explain limitations of HPLC. **[16]**

P.T.O.

Q5) Explain the principle of Ion Chromatography and also write a short note on types of various electrodes in ion chromatography? **[16]**

SECTION - II

Q6) a) List out the various enzymes and metabolic reactions and what is their role in the field of environmental microbiology? Explain facultative respiration in wastewater treatment. **[10]**

b) Explain role of microorganism, its cell structure, metabolism and nutrient required for its growth in wastewater treatment and in various biological processes. **[8]**

Q7) a) Write a note on Compound Microscopy and Micrometry and their applications in the environmental Engineering? **[10]**

b) Explain principle and application of Microscopy and Micrometry used in Environmental Engineering? Explain isolation of microorganisms. **[6]**

Q8) a) Explain Media and Techniques of Staining and Enumeration of microorganism in water and wastewater? **[10]**

b) Explain isolation of microorganisms and its importance in environmental engineering. **[6]**

Q9) a) What is 'Soil Bioremediation', explain it with suitable example? Explain the phenomenon of 'Self purification of natural water body? **[5]**

b) Explain Industrial microbiology and how this knowledge used in the treatment of various types of industrial wastewater. **[5]**

c) Explain in details Biological process (aerobic, anaerobic and natural system) of wastewater and how treatment can be done. **[6]**

Q10) Explain in detail principles, design parameters and drawbacks of Sequencing Batch Reactor (SBR) Process along with diagram to treat the wastewater? **[16]**

Total No. of Questions : 8]

SEAT No. :

P3434

[Total No. of Pages : 2

[4660] - 88

M.E.(Civil) (Environmental Engineering)

SOLID AND HAZARDOUS WASTE MANAGEMENT

(2010 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Explain the problems and issues of Solid and Hazardous waste management in Urban areas? Discuss the environmental impacts of mismanagement of Solid and Hazardous waste. **[18]**

Q2) a) Define the landfills? Explain the essential components of land filling. **[8]**

b) Discuss the energy recovery from solid waste. **[8]**

Q3) Discuss the various elements of financial management plan for solid waste.**[16]**

Q4) Discuss the Biomedical waste management and handling rules. Explain how will you manage the Biomedical waste from a hospital located in rural areas.**[16]**

P.T.O.

SECTION - II

Q5) a) Discuss the elements of a Leachate control system. **[8]**

b) Explain with Neat sketch a double liner hazardous waste landfill. **[8]**

Q6) Explain the principle, construction and working of the following with neat diagram. **[16]**

a) Waste heat boilers

b) Pyrolysis

Q7) Explain the goal of risk assessment. Discuss the concept of zero-risk hazardous waste management. **[16]**

Q8) Write a short note on following :

a) Management of Nuclear waste. **[6]**

b) Waste heat recovery and co-generation. **[6]**

c) Manifest system for disposal of hazardous waste. **[6]**

Total No. of Questions : 8]

SEAT No. :

P3293

[Total No. of Pages : 2

[4660] - 89

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

GROUND WATER CONTAMINATION AND POLLUTION TRANSPORT (Elective - III)

(2010 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:-

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

SECTION - I

Q1) a) Explain with a neat sketch : Aquifer classification based upon the hydraulic conductivity of the media. **[8]**

b) Distinguish between ground surface contours and water table contours. Explain how water table contours are prepared and state their uses. **[8]**

Q2) a) What are flow nets? Explain with suitable example any one method of constructing flow nets. **[8]**

b) How dispersion studies are helpful in understanding the GW flow. **[8]**

Q3) a) Explain with reference to urban area, how contamination of GW can be reduced by adopting proper wastewater management practices? **[8]**

b) Derive equations for steady state conditions involving Uniform Recharge. **[8]**

P.T.O.

Q4) a) Explain with a neat sketch: Well Interference. What is its effect on drawdown? **[10]**

b) An organic waste with very high pollution strength, has contaminated a GW aquifer. Explain in detail the method to be adopted for recovering this aquifer. **[8]**

SECTION - II

Q5) a) Explain how the rock forms affect the GW availability wrt various rock types. **[8]**

b) Explain Tri-linear diagram for representing analyses of GW Quality. **[8]**

Q6) a) What is sea water intrusion? Explain Ghyben – Herzberg relation wrt confined aquifers. **[10]**

b) Explain in detail relation between dispersion and GW hydrology. **[6]**

Q7) a) Explain the importance of Physico – chemical and biological analysis of GW. **[8]**

b) Explain underground travel phenomenon of GW contamination. **[8]**

Q8) a) Explain in detail, the role of social media and public participation in enhancing GW potential in an area. **[10]**

b) Explain the dispersion analysis of contaminant transport in fractured rock. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P3479

[Total No. of Pages :2

[4660] -9
M.E. (Civil) (Const. & Mgmt.)
ELECTIVE : TQM IN CONSTRUCTION
(2008 Pattern)

Time : 4 Hours] *[Maximum Marks :100*

Instructions to the candidates:

1) ***Answer any 3 Questions from section - I and 3 from Section - II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Discuss, with specific examples the various barriers which affect implementation of TQM program in the construction industry. Elaborate, as a manager, how you will overcome these barriers. **[10+8]**

Q2) "TQM implementation is at its best, when the cost for any product or service is minimum, both to the supplier and the customer, at the same time having the maximum value to the customer". Explain the validity of the above statement, with different examples on a construction project. **[16]**

Q3) With examples, compare and contrast between

a) Quality and quality policy. **[4]**

b) Quality objectives and quality documentation. **[4]**

c) Quality assurance and total quality control **[4]**

d) Quality management and TQM **[4]**

Q4) Discuss the contribution to quality by

a) Deming **[4]**

b) Juran **[4]**

c) Crossby **[4]**

d) Quality professionals in India **[4]**

P.T.O.

SECTION - II

Q5) Explain with examples

a) PDCA cycle **[3]**

b) Quality Circle **[3]**

c) NCR **[4]**

d) Quality Audit **[4]**

e) Quality Philosophy **[4]**

Q6) Draft formats for

a) Conduct of material tests on cement concrete. **[6]**

b) Maintaining concrete cube/cylinder test records. **[4]**

c) Cheking quality aspects of reinforcement steel placed in formwork. **[6]**

Q7) Explain the various types of costs associated with poor quality, with proper examples. **[16]**

Q8) Explain the following:

a) ISO 9001 : 2000 principles **[4]**

b) Six sign. technique **[4]**

c) PRRT software **[4]**

d) Quality check lists **[4]**

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Total No. of Questions : 10]

SEAT No. :

P2773

[Total No. of Pages :2

[4660] - 90
M.E. (Civil -Environmental Engg.)
b - AGRICULTURAL POLLUTION CONTROL AND ENVIRONMENTAL BIOTECHNOLOGY
(2008 Course) (Elective - III) (Semester - II) (501511)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Figures to the right indicate full marks.***
3) ***Your answers will be valued as a whole.***
4) ***Assume suitable data, if necessary.***
5) ***Use of electronic pocket calculator, log arithmic table table, slide rule, mollier charts and steam table is allowed.***

SECTION - I

Q1) Explain the following: **[8+8]**

a) Types of Farming systems.

b) Agro meteorological Parameters.

Q2) a) What you understand by soil and water conservation practices. **[8]**

b) Give note on agrochemicals and its suitability. **[8]**

Q3) Write in details the causes and effects of followings: **[8+8]**

a) Water logging.

b) Soil Salinity

Q4) a) As a Environmental engineer how you can use wastewater fro agriculture? Explain. **[9]**

b) How you can control and manage agriculture waste? **[7]**

Q5) a) What you understand by agricultural pollution? **[18]**

b) What is vermicompost? How it is useful agricultural activities?

c) Write about Slow-release fertilizers.

P.T.O.

SECTION - II

Q6) a) Explain the concept of environmental biotechnology. **[8]**

b) Explain about genetic engineering and genetic code. **[8]**

Q7) Explain in brief about **[5+5+6]**

a) Protein synthesis

b) Transcription

c) Replication of DNA

Q8) a) Explain rotating discs and rotating drums. **[8]**

b) Explain Up flow anaerobic sludge blanket reactor. **[8]**

Q9) a) Discuss the treatment schemes waste water of dairy in detail. **[8]**

b) What is aerobic and anaerobic process? Explain in details. **[8]**

Q10) Give note on **[18]**

a) Biotechnology in reduction of CO_2.

b) Bio-trickling filters.

c) Methane production.

Total No. of Questions : 8]

SEAT No. :

P2774

[Total No. of Pages :2

[4660] - 91
M.E. (Civil -Environmental Engg.)
c - ENVIRONMENTAL SANITATION
(2008 Course) (2010 Course) (Elective - III) (501511) (Semester - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Which micro-organisms are responsible for communicable diseases? What are the methods of communication? **[8]**

b) What do you mean by Communicable disease? List down the communicable diseases and their mode of transmission. **[8]**

Q2) a) Explain the natural and chemical factors of diseases control methods. **[8]**

b) "Food establishments must have an effective fly control program". Justify. **[8]**

Q3) a) Which disinfectants are generally used? Explain the specific use with an importance. **[8]**

b) In order for your Rodent control program to be effective on a long term basis, what measures will you adopt? Explain. **[8]**

Q4) Write short notes on: **[18]**

a) Light and Ventilation in hospitals.

b) Sanitation: Swimming pools.

c) Plague control.

P.T.O.

SECTION - II

Q5) a) What is an Occupational hazard? Explain the common workplace hazards. **[8]**

b) Write down only the list of workplace Environmental ISO standards. **[8]**

Q6) a) What are the best practice approaches and designs for creating demand and strengthening supply leading to sustainable, effective, large-scale sanitation programs? **[8]**

b) What do you understand by Low cost excreta disposal system? **[8]**

Q7) a) What are the problems of water supply in rural areas? How to null the same. Explain. **[8]**

b) Explain any one case study on sanitation. **[8]**

Q8) Write short notes on: **[18]**

a) Toilet linked biogas plants.

b) Lighting in industry with a neat sketch.

Total No. of Questions : 8]

SEAT No. :

P3294

[Total No. of Pages : 3

[4660] - 92

M.E. (Civil) (Environmental Engineering)

GROUND WATER CONTAMINATION AND POLLUTION TRANSPORT

(2010 Pattern) (Open Elective)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:-

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

SECTION - I

Q1) a) Explain in detail, the importance of G.W. What are the sources of pollution for GW? Enlist 4 assumptions made in deriving general differential equations for GW flow. **[8]**

b) Explain in detail the steady state continuity equation for GW flow in a homogeneous isotropic aquifer. **[8]**

Q2) a) Explain how to find yield from a well. **[10]**

b) Explain the procedure for drawing flow nets using : **[8]**

i) Graphical Method.

ii) Numerical solution.

P.T.O.

Q3) a) Explain with suitable sketch : well interference. **[6]**

b) Tracer injected into a well took 4.5 hours to travel up to another well 50 m apart. The difference in water surface elevation was found to be 1.25 m; the aquifer samples indicated a porosity of 35%. Determine the following : **[6]**

i) Permeability.

ii) Seepage velocity and

iii) Reynold's no. of flow.

Assume average grain size as 1 mm and kinetic viscosity at 27 deg C. for water as 0.008 Stokes.

c) Explain in brief sea water intrusion. **[4]**

Q4) a) Assume that three piezometers are installed very close to each other but penetrate up to different depths as given below : **[6]**

Piezometer	l	m	n
Elevation at surface (m)	550	550	550
Depth of piezometer (m)	125	100	75
Depth of Water (m)	20	42	35

Let L, M and N refer to the points of measurement of piezometers l, m and n respectively. Calculate :

i) GW head at l, m and n in meters.

ii) Pressure head at l, m and n in m.

iii) Fluid pressure at m in N/m^2.

b) Distinguish between ground surface contour and water table contours. Explain how water table contours are prepared and state their uses. **[6]**

c) Explain the following terms : **[4]**

i) Aquifer.

ii) Aquiclude.

iii) Aquifuge.

iv) Aquitard

SECTION - II

Q5) a) Explain GW availability in Maharashtra with special reference to geology of the area. **[8]**

b) Explain need of social awareness and public participation in GW recharging activities. Support your answer with one case study from Maharashtra. **[8]**

Q6) a) Explain in detail relation between dispersion and GW hydrology. **[8]**

b) Explain in detail how GW pollution phenomenon can be studied. Support your answer with special reference to a case study of open dumping site for MSW. **[8]**

Q7) a) Explain the importance of geotechnical investigations required for carrying out GW potential in an area. **[8]**

b) Explain underground travel phenomenon of GW contamination. Support your answer with a case study. **[8]**

Q8) a) Explain the importance of water analysis and water quality requirements with special reference to GW as source for : **[9]**

i) Drinking Purpose.

ii) Agricultural Purpose.

iii) Industrial Usage.

b) Explain in detail : Sea Water Intrusion. **[9]**

Total No. of Questions : 8]

SEAT No. :

P2775

[Total No. of Pages :2

[4660] - 93
M.E. (Civil -Environmental Engg.)
b - ENVIRONMENTAL SANITATION
(2008 Course) (2010 Course) (Semester-II) (Open Elective -IV) (501512)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Which micro-organisms are responsible for communicable diseases? What are the methods of communication? **[8]**

b) Explain the diseases communicated by the discharges of intestines, nose and throat. Specify also the control measures to be taken. **[8]**

Q2) a) Explain the various fly control techniques available. **[8]**

b) Explain the natural and chemical factors of diseases control methods. **[8]**

Q3) a) In order for your Rodent control program to be effective on a long term basis, what measures will you adopt? Explain. **[8]**

b) How will you achieve sanitation in case of **[8]**

i) Hospitals and

ii) Swimming pools.

Q4) Write short notes on: **[18]**

a) Plague control

b) Insecticide

c) Light and Ventilation in hospitals

P.T.O.

SECTION - II

Q5) a) What is an Occupational hazard? Explain the common workplace hazards. **[8]**

b) Write down only the list of workplace Environmental ISO standards. **[8]**

Q6) a) Discuss in detail the various problems associated with Rural sanitation. **[8]**

b) Comment on "Improvement schemes for rural sanitation." **[8]**

Q7) a) Explain the measures taken to prevent poisoning by industrial poisons. **[8]**

b) What are the occupational hazards in industry? Explain. **[8]**

Q8) Write short notes on: **[18]**

a) Soak pit with a neat sketch.

b) Toilet linked biogas plants.

Total No. of Questions : 8]

SEAT No. :

P2776

[Total No. of Pages : 2

[4660] - 93A

M.E. (Civil - Environmental Engineering)

c - OCCUPATIONAL SAFETY & HEALTH

(2008 Course) (2010 Course) (Semester - II) (Open Elective - IV) (501512)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) What are the OHSHAS 18001 Health & Safety Standards? **[8]**

b) Comment in detail on occupational safety and health administration. **[8]**

Q2) a) What is a need of ergonomics program? Explain. **[8]**

b) Explain ergonomics program. **[8]**

Q3) a) How to control hazards in Chemical industry. **[8]**

b) Explain Human error and fault tree analysis. **[8]**

Q4) Write short notes on following. **[18]**

a) Hazard analysis.

b) Task analysis.

c) Right to know laws.

P.T.O.

SECTION - II

Q5) a) What measures are required for the prevention and protections of the fire? Explain. **[8]**

b) What are the types of fire? Explain any two. **[8]**

Q6) a) Comment on occupational health. Explain requirement of safety consideration to maintain health. **[8]**

b) List down the causes of accidents in an industry & what are the remedial measures you will take to avoid further accidents. **[8]**

Q7) a) What are the health problems in pharmaceutical industries? **[8]**

b) Which occupational health and safety considerations are required in waste water treatment plants? Explain. **[8]**

Q8) Write short notes on following. **[18]**

a) Electrical safety.

b) Extinguishing fire.

c) Personal Protective Equipments for safety on construction site.

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Total No. of Questions : 10]

SEAT No. :

P2777

[Total No. of Pages : 2

[4660] - 94

M.E. (Civil) (Water Resource and Environmental Engg.)
ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY
(2010 Course) (Semester - I) (501601)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) Explain the concept, scope and segments of Environmental chemistry. Also discuss effect of gravitational force and rain scrubbing on air pollutants. **[16]**

Q2) Discuss the following: **[16]**

a) Water quality parameters.

b) Chemistry of pollutants in Hydrosphere.

Q3) How trace & ultra trace concentrations are determined. Explain various technique used with their principle, merits and demerits. **[16]**

Q4) What are Hydrocarbons? Explain chemistry of hydrocarbondecay. Also discuss their effects on environment. **[16]**

Q5) Write note on: **[18]**

a) Lead and it' s compounds.

b) Synthetic polymers.

P.T.O.

SECTION - II

Q6) Discuss growth rate curve for bacteria. Also explain MPN technique for E-coli detection. **[16]**

Q7) Explain spectroscopic technique NAA and GCMS. **[16]**

Q8) Discuss classification of algae and factors affecting algal growth. Also explain role of microbes in biological waste treatment. **[16]**

Q9) Discuss types and metabolic classification of micro organisms. Also highlight on microbial metabolism. **[16]**

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

a) Environmental sensing technique.

b) Cell morphology.

c) Gene transfer and recombinant DNA Technology.

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Total No. of Questions : 8]

SEAT No. :

P2778

[Total No. of Pages : 3

[4660] - 96
M.E. (Civil - WREE)
ADVANCED FLUID MECHANICS
(2008 Pattern) (Semester - I) (501603)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Derive the most general form of equation of continuity in three dimensions using Cartesian co-ordinate system. **[10]**

b) Define two dimensional source and sink. Obtain the expressions for velocity potential function and stream function for source and sink in Cartesian and polar co-ordinates. Sketch the patterns of equipotential lines and streamlines also. **[8]**

Q2) a) In what respects are Navier-Stoke's equations different from Euler's equations of motion both for three-dimensional flow in Cartesian co-ordinate system. Obtain the derivation of Navier-Stoke's equations starting from Euler's equation of motion. **[8]**

b) Using Navier-Stoke's equations or otherwise, derive the general equation for velocity distribution for steady incompressible laminar flow between parallel surfaces. **[8]**

P.T.O.

Q3) a) For laminar boundary layer having velocity distribution given by $\frac{u}{U}=\frac{3}{2}\left(\frac{y}{\delta}\right)-\left(\frac{y}{\delta}\right)^3$, obtain the expressions for nominal thickness of boundary layer, wall shear stress, local drag co-efficient and mean drag co-efficient. Assume zero pressure gradient.

Notations have usual meanings. **[12]**

b) Boundary layer separation can be delayed, but cannot be avoided. Justify the authenticityof this statement. **[4]**

Q4) Write short notes on ANY FOUR of the following: **[16]**

a) Laminar Sublayer;

b) Cauchy-Reimann equations;

c) Circulation;

d) Relaxation method;

e) Conformal mapping.

SECTION - II

Q5) a) Differentiate between isotropic turbulence and homogeneous turbulence. **[5]**

b) Explain probability density function. **[5]**

c) State the general form of Reynolds' equation of motion and explain the significance of each of the terms in the equation. **[6]**

Q6) a) Explain Prandtl's mixing length hypothesis. **[6]**

b) A Pipe of 300mm diameter carries oil of specific gravity 0.8 and kinematic viscosity of 0.0225 stokes at the rate of 540 lps. Determine: **[12]**

i) Maximum permissible height of roughness protrusions upto which the pipe behaves as a smooth pipe;

ii) The height of protrusions beyond which the pipe would become a rough pipe.

Q7) a) Starting from fundamentals, show that the velocity of sound in an adiabatic gas flow is given by the equation $C = \sqrt{kRT}$. Notations have usual meanings. **[12]**

b) A jet plane has attained a flight speed of Mach number 2.2 at an attitude of 18km where the temperature is -55°C. Assuming k = 1.4 and R = 287 J/kg K, determine the speed of the plane. **[4]**

Q8) Write short notes on the following. **[16]**

a) Moody's diagram;

b) Karman's similarity hypothesis;

c) Mach Angle and Mach cone;

d) Normal shock waves.

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Total No. of Questions : 8]

SEAT No. :

P2779

[Total No. of Pages : 3

[4660] - 97

M.E. (Civil) (Water Resources and Environmental Engg.)
a- GROUND WATER CONTAMINATION AND TRANSPORT
(2012 Pattern)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Explain in details the importance of G.W. What are the source of Pollution for G.W.? **[8]**

b) Derive a general steady state continuity equation for G.W. flow in heterogeneous anisotropic aquifer. **[8]**

Q2) a) Explain in detail various factors that affect fluctuating in GW levels. **[10]**

b) Explain the procedure for drawing flow net using **[8]**

i) Graphical method

ii) Numerical solution

Q3) a) Explain with suitable sketch: Well interference. **[8]**

b) Trace injected into a well took 4 hours to travel up to another well 50 m apart. The difference in water surface elevation was found to be 1.0m the aquifer sample indicated a porosity of 30%. Determine the following **[8]**

P.T.O.

i) Permeability

ii) Seepages velocity

iii) Reynold's no. of flow.

Q4) a) Obtain an expression for discharge through a flow net for an isotropic aquifer. **[8]**

b) Explain piezometer test pumping. **[8]**

SECTION - II

Q5) a) What is meant by groundwater pollution control? Explain vyredox method for in situ chemical treatment of groundwater. **[8]**

b) What are various method of treatment of organic matter in ground water. Explain any on method with its application & cost economics. **[10]**

Q6) a) Assume that three piezometer are installed very close to each other but penetrate up to different depth as given below: **[8]**

Piezometer	A	B	C
Elevation at surface (mtr)	500	500	500
Depth of piezometer (mtr)	150	110	50
Depth of water (mtr)	27	47	36

Let A, B and C refer to the point of measurement of piezometer a, b and c respectively, calculate:

i) GW heat at a, b and c in meters.

ii) Pressure head at a, b and c in meter

iii) Fluid pressure at B in N/m^2.

b) Explain following terms. **[8]**

i) Aquifer

ii) Aquiclude

iii) Aquifuge

iv) Aquitard

Q7) a) Discuss in briefly Hydro chemical fancies in GW contamination and explain its utility. **[8]**

b) Explain how the rock forms affects the GW availability wrt following rock type **[8]**

i) Carbonate terrain

ii) Crystalline rock

iii) Complex sedimentary system.

Q8) a) What is the utility of GW investigation? Explain seismic refraction and reflection method of GW investigation. **[8]**

b) Enlist any 4 methods of GW recharge. Explain any one in details. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P2780

[Total No. of Pages : 2

[4660] - 98
M.E. (Civil) (WREE)
b- HYDROLOGY AND GROUND WATER
(2012 Pattern) (Semester - I) (Elective - I) (501604)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) Briefly explain the factors affecting precipitation at a specific location. **[6]**

b) The ordinates of instantaneous unit hydrograph of a basin are as follows. Derive the direct runoff hydrograph for this catchment due to a storm of 4-hr. duration and having a rainfall excess of 5cm. **[10]**

Time (hours)	0	1	2	3	4	5	6	7	8	9	10	11	12
IUH(m^3/s)	0	8	35	50	47	40	31	23	15	10	6	3	0

Q2) a) Write a note on components of time series. **[8]**

b) Write a short note on Risk, Reliability and Safety Factor. **[8]**

Q3) a) What is meant by 'Return Period'. Give few formulae to determine it. **[8]**

b) Explain Log-Pearson type III distribution. **[8]**

P.T.O.

Q4) Write short note on. **[18]**

a) Minimum density of rain gauge stations.

b) Gumbel's method

c) Envelop curve

SECTION - II

Q5) a) Write a note on interference of wells. **[8]**

b) In a 8m thick artesian aquifer, a 10cm diameter well is pumped at a constant rate of 100 LPM. The steady state drawdown observed in two wells located at 10 m and 50 m distances from the centre of the well are 3m and 0.05m respectively. Compute the transmissibility and hydraulic conductivity of the aquifer. **[8]**

Q6) a) Write a note on sea water intrusion. **[8]**

b) Discuss any two methods of ground water exploration. **[8]**

Q7) a) Explain seepage characteristics of surface water. **[8]**

b) Write a note on ground water budget. **[8]**

Q8) Write short notes on: **[18]**

a) Artificial recharge of groundwater.

b) Groundwater resource of India.

c) Method of images.

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Total No. of Questions : 12]

SEAT No. :

P2781

[Total No. of Pages : 3

[4660] - 99

M.E. Civil (Water Resources & Environmental Engg.)
c- AIR POLLUTION ENGINEERING
(2008 Pattern) (Semester - I) (Elective - I) (501604)

Time :3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer Que 1 or Que 2, Que 3 or Que 4, Que 5 or Que 6 from Section - I.***
2) ***Answer Que 7 or Que 8, Que 9 or Que 10, Que 11 or Que 12 from Section - II.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Assume suitable data, if necessary.***
6) ***Use of electronic pocket calculator and steam table is allowed.***

SECTION - I

Q1) Discuss the following:-

a) Solar radiation. **[9]**

b) Maximum mixing depth. **[8]**

OR

Q2) a) What do you mean by Wind Rose diagram? Explain the same with a typical diagram. **[8]**

b) What is lapse rate? Discuss its relation with temperature variation. **[8]**

Q3) a) What is dispersion of pollutants in atmosphere? Explain. **[8]**

b) Explain Eddy diffusion model in details. **[8]**

OR

Q4) a) Give note on followings **[4]**

i) Ground level concentration

ii) Gaussian model of dispersion. **[6]**

b) Discuss in Inversion Trap. **[7]**

P.T.O.

Q5) a) What are the sources of indoor pollution? Discuss. **[9]**

b) Discuss about odour pollution. How you will control the same. **[8]**

OR

Q6) a) Discuss in detail about Air pollution survey. **[8]**

b) Explain in detail Iso-kinetic sampling. **[9]**

SECTION - II

Q7) a) What is the minimum size of the particulates removed though the following control equipments. **[8]**

i) Settling chambers

ii) Cyclones

iii) Fabric Filters

iv) ESP's

b) Discuss distribution and source of Suspended Particulate Matter. **[9]**

OR

Q8) a) Discuss followings **[8]**

i) Inertial Separator

ii) Venturi Scrubbers

b) Discuss the factors to be considered while selecting particulate collector. **[8]**

Q9) Give note on the following and explain. **[16]**

a) Absorption and Solution used

b) Adsorption and Solution used

OR

Q10)a) Discuss about Closed Circuit and Recovery System. **[9]**

b) Discuss and explain the Control of Sulphuric dioxide. **[8]**

Q11)a) Discuss the followings **[12]**

i) Exhaust Emission

ii) Crank-Case Emission

iii) Evaporative Emission

b) Give note on the alternatives to reduce air pollution due to automobile sources. **[5]**

OR

Q12)a) What you understand from Nitrogen Oxides in Exhaust Gas. **[8]**

b) Discuss strategy for control of air pollution in India. **[9]**

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