

Total No. of Questions : 10]

SEAT No. :

P4088

[Total No. of Pages : 3

[5461]-501

B.E. (Civil)

ENVIRONMENTAL ENGINEERING - II
(2015 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Draw neat figures wherever necessary.
- 4) Assume any missing data if necessary.
- 5) Use of scientific calculators is allowed.

- Q1)** a) Write objective and methodology adopted for cleaning of rivers in National River Cleaning Plan. [5]
b) Draw a process flowchart for sewage treatment plant (STP) consisting primary and secondary treatment. [5]

OR

- Q2)** a) Determine treatability index of wastewater for given data and suggest type treatment with respect to treatability index. [5]

Given data:

Sr.No.	BOD ₅ day (mg/L)	COD (mg/L)
1	155	297
2	95	297

- b) What is the sludge bulking? Explain the control measures for the same. [5]

- Q3)** a) Differentiate conventional and high rate tricking filter. [5]
b) Write the different disposal methods of grit and explain any one method of disposal of grit. [2+3]

OR

- Q4)** a) Write Streeter-Phelps equation and explain the meaning each term involved in it. [2+3]
b) Write working principle of rotating biological contractor, advantages and disadvantages. [1+2+2]

P.T.O.

Q5) a) Write working principle of purification of wastewater treatment of root zone cleaning system; draw its schematic sketch and write its application.

[2+3+2]

b) Design an oxidation pond for following data. [8]

- i) Location = 28° latitude
- ii) BOD loading at 28° latitude = 200 kg/ha/d.
- iii) Elevation = 1200 m above sea level.
- iv) Mean monthly temperature = 35°C maximum and 15°C minimum.
- v) Sky clearance is more than 75%.
- vi) Population to be served = 25000.
- vii) Sewage flow = 1001 pcd.
- viii) Inlet BOD_5 = 200 mg/l
- ix) Desired effluent BOD_5 = 20 mg/l
- x) Pond removal constant at 20°C = 0.1/d.

OR

Q6) a) Design an aerated lagoon for following data. [8]

- i) Raw sewage flow = 20 MLD
- ii) Raw sewage BOD_5 = 200 mg/l
- iii) Desired BOD_5 = 20 mg/l
- iv) Kinetic constant : $Y = 0.6/d$ BOD removal rate constant (K_d) at $20^{\circ}\text{C} = 0.1/d$
- v) Hydraulic retention time (SRT) = 6 days
- vi) Endogenous decay coefficient $k_d = 0.06$
- vii) Mean cell residence time = 10 days
- viii) $f = 0.68$
- ix) Assume depth of aerated lagoon = 2m
- x) Assume length to width ratio = 3

Determine,

- a) Volume and dimensions of aerated lagoon
- b) Oxygen requirement

b) Write working principle of phytoremediation technology for wastewater treatment; draw its schematic sketch and write its application. [2+3+2]

- Q7)** a) Write principle and stages of anaerobic digestion. Explain factors affecting digestion process. [2+2+3]
b) Explain any two methods of sludge disposal with advantages disadvantages and application. [8]

OR

- Q8)** a) Draw a neat sketch of up flow anaerobic sludge blanket (UASB) reactor. Explain the principle of working and comment on its suitability for treatment of industrial waste water. [2+3+2]
b) Draw neat sketch of conventional sludge digester and explain the following : [8]
i) Different stages of digestion process.
ii) Design parameters of anaerobic digester.
iii) Capacity of digester.

- Q9)** a) Explain with neat sketch equalization and proportioning as applicable to Industrial Waste Treatment. [8]
b) Explain the following points related to dairy industry. [6]
i) Characteristics of wastewater.
ii) Flow sheet of wastewater treatment.
c) Enlist different units used in preliminary, primary and secondary treatment in industrial wastewater treatment. [2+2+2]

OR

- Q10)** a) Explain with a neat sketch importance of neutralization as applicable to Industrial Wastewater Treatment. [8]
b) What are the process carried out to recycle and reuse of treated wastewater. [6]
c) Explain the following points related to sugar industry: [6]
i) Characteristics of wastewater.
ii) Flow sheet of wastewater treatment.



Total No. of Questions : 10]

SEAT No. :

P3710

[Total No. of Pages : 3

[5461]-502

B.E. (Civil)

TRANSPORTATION ENGINEERING
(2015 Pattern)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator and steam tables is allowed.
- 4) Assume suitable data if necessary.
- 5) Neat diagrams must be drawn wherever necessary.

- Q1)** a) What are the characteristics of road transport in comparison with other systems. [5]
- b) Calculate the minimum sight distance required to avoid a head-on-collision of two cars approaching from the opposite directions at a speed of 100 Kmph and 60 Kmph. Assume a reaction time of 2.5 sec, coefficient of friction of 0.7 and a brake efficiency of 75%. [5]

OR

- Q2)** a) There are three alternate proposals of road plan, the details of which are given below. Suggest the order of priority for phasing the road construction work based on maximum utility approach. Assume utility points of 0.5, 1 and 2 for the three population ranges and utility unit of 2 per 1000 tonne of agricultural products served. [5]

Proposal	Length km	Population <2000	Population 2001-5000	Population 5001-10000	Agricultural Productivity in thousands tonnes
A	500	100	60	20	100
B	600	150	70	30	150
C	700	200	80	40	200

- b) Explain the ‘PIEV’ theory. [5]

P.T.O.

- Q3)** a) Why extra widening is provided on horizontal curves? Calculate the extra widening required for a two-lane road on a horizontal curve of radius 150 m if the longest wheel base of a vehicle expected on the road is 6 m. Design speed is 60 Kmph. [6]
- b) What are the objectives of carrying accident studies? How are the results of this study used? [4]

OR

- Q4)** a) Define : [6]
- i) Traffic Volume
 - ii) Spot Speed
 - iii) Running Speed
 - iv) Basic Capacity
- b) Explain Origin and Destination study. What are the various uses of O & D studies? [4]

- Q5)** a) Explain how Cutbacks are prepared. Also state their types. [5]
- b) Define ‘flaky’ aggregates. Explain the procedure for finding flakiness index in the laboratory. [6]
- c) Why is viscosity-based gradation of bitumen done nowadays instead of penetration grade? List the recommended viscosity grade of bitumen for use in India. [5]

OR

- Q6)** a) With respect to Marshall Stability Test define : [5]
- i) Flow Value
 - ii) VMA
 - iii) VFB
 - iv) Theoretical Specific Gravity and
 - v) Marshall Stability Value
- b) Explain with a neat sketch the procedure for conducting Impact test on aggregates. [6]
- c) How is Crumb Rubber Modified Bitumen obtained? State the advantages over normal bitumen. [5]

- Q7)** a) Find the expected traffic with the following data. [6]
- i) Type of road – Two Lane single carriageway
 - ii) Initial traffic in each direction in the year of completion of construction = 1500 CV/day
 - iii) Design life = 15 yr
 - iv) Traffic growth rate = 7.5%
 - v) Vehicle Damage factor = 2.5
 - vi) CBR of soil = 6%
 - vii) LDF = 0.5
- b) What are other critical stress conditions on a rigid pavement? [6]
- c) Draw a typical cross section of flexible pavement and highlight the importance of each layer. [6]

OR

- Q8)** a) Enumerate the various types of joints in cement concrete pavement. Explain any one in brief. [6]
- b) Describe any two factors governing the design of concrete pavements. [6]
- c) Explain the concept of ESWL with a neat sketch. [6]
- Q9)** a) Explain the concept of Super pave Mix Design Technology. [5]
- b) Write a note on : [6]
- i) Dense Bituminous macadam and
 - ii) Dry Lean Concrete
- c) Describe the construction procedure of WBM pavements. [5]

OR

- Q10)** a) What are the advantages of cold mix technology over hot mix asphalt technology? [5]
- b) Write a note on : [6]
- i) Pavement Quality Concrete and
 - ii) Built Up Spray Grout (BUSG)
- c) Explain at what stages of pavement construction are prime coat, tack coat and seal coat used. [5]



Total No. of Questions : 10]

SEAT No. :

P3287

[Total No. of Pages : 3

[5461]-503

NOV/DEC.-18 B.E. (Civil)

STRUCTURAL DESIGN AND DRAWING - III

(2015 Pattern) (Semester - I) (End Sem.)

Time : 3 Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.
- 2) Neat sketches must drawn wherever necessary.
- 3) Figures to right indicate full marks.
- 4) Assume suitable data if necessary.
- 5) IS 1343:2012, IS 1893-2016, and IS 456:2000 are allowed in examination.
- 6) Use of electronic pocket calculator is allowed.
- 7) Use of cell phone is prohibited during examination.

Q1) a) How to reduce loss due to friction. [3]

b) Determine ultimate shear resistance of the section cracked in flexure using IS 1343:2012. Section is unsymmetrical I-section with overall depth of 830mm, bw=130mm. Beam is subjected to ultimate moment of 573 kNm. Consider net ultimate shear force acting is 57 kN, fck=50 N/mm², fp=1750 N/mm², fpt=4.95 N/mm², Ixx=1.627×10¹⁰mm⁴ and Ap=1178mm². [7]

OR

Q2) a) Define the term post-tensioning. What are various Post-tensioning methods? [4]

b) A prestress beam 250mm wide and 360mm deep is prestressed by 10 wires of 8mm diameter initial stress to 1000 N/mm². The centroid of steel wire is located at 105 mm from the soffit. Determine the maximum stress in concrete immediately after transfer allowing elastic shortening of concrete only at the level of the centroid of steel. [6]

If, however the concrete is subjected to additional shortening due to creep and shrinkage and the steel is subjected to relaxation of stress 5% find the final percentage loss stress in the steel wire. Modular ratio = 5.70, creep coefficient = 1.60. Total residual shrinkage strain = 3×10^{-4} .

P.T.O.

- Q3)** a) The deck slab of road bridge of span 10m is a one way PSC slab with parallel post tensioned cables. Force at transfer in each cable is 400kN. Deck slab is supposed to support a UDL of 25 kN/mm². Compressive and tensile stress in concrete at any stage doesn't exceed 12 N/mm² and 0 N/mm² respectively. Determine the only depth of slab assuming 20% prestressing loss. [3]
- b) Design a post tensioned concrete two way slab 6m × 9m with discontinuous edge to support imposed load of 3 kN/m². Cables of 4 wires of 5mm diameter carrying effective prestressing force of 100 kN are available for use. Design the spacing of the cables in both directions. Assume $F_{ck} = 40 \text{ N/mm}^2$, $F_p = 1600 \text{ N/mm}^2$, $E_c = 38 \text{ kN/mm}^2$. [7]

OR

- Q4)** a) What are limitations of Direct Design Method for designing of flat slab? [3]
- b) An end block of a post tensioned beam is 350 mm × 500 mm. The prestressing force is 900 kN with the tendon placed centrally at the ends. A bearing plate of 200 mm × 200 mm is provided. Check for the bearing stresses developed in concrete whose strength at transfer is 40 N/mm². [7]

- Q5)** Design a RCC T-shaped retaining wall to retain earthen embankment of 4.2 m height above the ground level. Embankment is sloping at an angle of 20° with horizontal. Unit weight of earth is 18 kN/m³. Angle of repose is 30°. Good foundation is available at depth of 1.1 m below ground level. SBC of soil is 160 kN/m². Coefficient of friction between concrete and soil may be taken as 0.62. Use M20 and Fe 415. Sketch reinforcement details. [17]

OR

- Q6)** Design L-shaped retaining wall for levelled backfill for following data. Height of retaining wall is 4.62 m, angle of internal friction 30°, unit weight of soil is 18 kN/m³, surcharge load is 20 kN/m² and SBC is 180 kN/m². Coefficient of friction between base slab and underlying strata is 0.55. Draw lateral pressure diagram and details of reinforcement detailing of base and stem showing curtailment. [17]

Q7) a) Design of circular water tank using IS code method for 1 lakh litres capacity. The joint between the wall and base of tank is rigid. The tank rests on ground. [12]

b) Explain the procedure to assess the crack width in flexure in water retaining structures as per latest codal provisions. [5]

OR

Q8) Design a rectangular tank of capacity 90,000 liters using approximate method of analysis. The height of water tank including free board 3.3m. Tank is resting on firm ground. Use M20 and Fe415. Sketch reinforcement details. [17]

Q9) a) Evaluate the seismic design force in x and y direction of different floor level as per IS 1893 for [12]

- i) LL Intensity = 3 kN/m²
- ii) FF = 0.75 kN/m²
- iii) Thickness of slab = 150 mm
- iv) Size of Beam = 300mm x 500 mm
- v) Size of column = 300mm x 600mm
- vi) Floor to floor height = 4m
- vii) No. of storeys=5
- viii) Brick wall thickness=230mm
- ix) Seismic zone = IV
- x) Strata is hard available

Assume suitable data if necessary.

b) Define Degree of Freedom. Explain SDOF and MDOF with example. [4]

OR

Q10)a) Derive the equation of motion for damped free vibration of a SDOF system. [8]

b) Explain the approximate methods of analysis for lateral and vertical loading for multi-storey frame. [8]



Total No. of Questions : 10]

SEAT No. :

P3288

[Total No. of Pages : 2

[5461]-504

B.E. (Civil)

STRUCTURAL DESIGN OF BRIDGES

(2015 Pattern) (End Semester) (Elective-I) (Semester-I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4 or Q.5 or Q.6, Q.7 or Q.8; and Q.9 or Q.10.
- 2) Figures in bold to the right indicate full marks.
- 3) Neat diagrams should be drawn wherever necessary.
- 4) If necessary, assume suitable data and indicate clearly
- 5) Use of electronic pocket calculator is allowed.

Q1) Explain various loads acting on railway steel bridges. [10]
OR

Q2) With a neat sketch, explain the components in super-structure and sub structure of a railway steel bridge. [10]

Q3) Explain Pigeud's method with a suitable example. [10]
OR

Q4) An interior panel of a T - beam deck slab bridge is $3.5 \times 4.0\text{m}$. The thickness of the slab is 300 mm. Calculate design bending moment due to (a) dead load and b) live load shown in fig.1. Adopt $m_1 = 0.025$, $m_2 = 0.18$. [10]

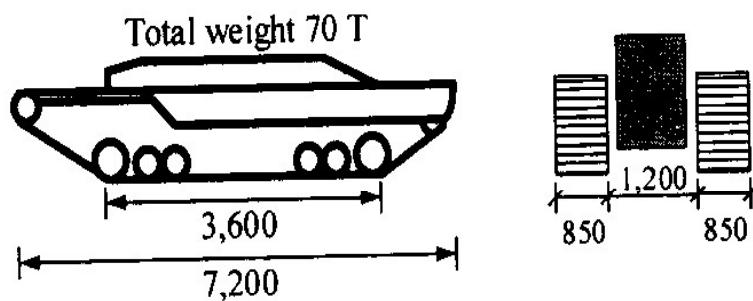
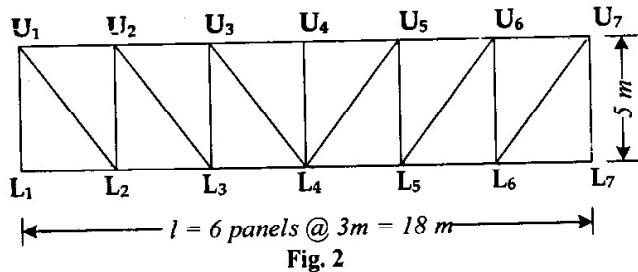


Fig.1

P.T.O.

Q5) Determine the design forces in members $U_1 U_2$, $U_1 L_1$ and $U_1 L_2$ for the railway steel bridge shown in fig. 2. [18]



Consider EUDL for BM and SF as 1,820 kN and 1,999kN respectively and CDA = 0.483. Any other data required may be considered accordingly.

OR

Q6) For the Problem given in Q.5, determine the design forces in members $L_3 L_4$, $U_3 L_4$, $U_4 L_4$. [18]

Q7) Explain the design procedure for a elastomeric bearing. [16]

OR

Q8) Explain with neat sketches various types of bridge bearings. [16]

Q9) Explain with neat sketches various types of piers used in highway bridges. [16]

OR

Q10) What are bridge abutments? Explain various forces acting on it. [16]



Total No. of Questions : 12]

SEAT No. :

P4227

[Total No. of Pages : 4

[5461]-505

B.E. (Civil)

**SYSTEM APPROACH IN CIVIL ENGINEERING
(Elective - I) (2015 Pattern)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer following the questions.*
- 2) *Figures to the right, indicate full marks.*

- Q1)** a) What is the scope and limitations of system approach? [3]
b) What is Linear programming problem & What are the requirements of LPP? [3]

OR

- Q2)** a) Solve graphically [3]

$$\text{Max } Z = 50X_1 + 18X_2,$$

subject to

$$2X_1 + X_2 \leq 100,$$

$$X_1 + X_2 \leq 80,$$

$$X_1, X_2 \geq 0$$

- b) For each of the following function show whether it is convex, concave. [3]
- i) $f(x) = 10 - x^2$
 - ii) $f(x) = x^4 + 6x^2 + 12x$
 - iii) $f(x) = 2x^3 - 3x^2$

- Q3)** a) Define [2]

- i) Queue length
- ii) Waiting time in Queue

- b) There are 7 jobs each of which has to go through machine A and B in order A-B.

Processing times in hour are given as below. Determine a sequence of these jobs that will minimise total elapse time. Also find t total elapse time, total idle time for machine A, B

P.T.O.

Job	Time required (hour)	
	A	B
1	3	8
2	12	10
3	15	10
4	6	5
5	10	12
6	11	1
7	9	3

[6]

OR

- Q4)** a) What do you mean by Monte Carlo Simulation. [2]
 b) Find the optimum sequence to get minimum time and sequence of operation A-C-B. [6]

Job	Time required (hour)		
	A	B	C
1	3	7	4
2	8	9	5
3	7	5	1
4	5	6	2
5	4	10	3

Find the total elapsed time & Idle time for A, B & C.

- Q5)** solve the following cost minimisation transportation problem using N-W method and Least cost cell method. [6]

Destination /Sources	A	B	C	D	Supply
I	3	1	7	4	300
II	2	6	5	9	400
III	8	3	3	2	500
Demand	250	350	400	200	

OR

[5461]-505

Q6) Five men are available to do five different jobs. From past record the time (in hrs) that each man takes to do each job is given in following table: [6]

Men	Jobs				
	I	II	III	IV	V
A	2	9	2	7	1
B	6	8	7	6	1
C	4	6	5	3	1
D	4	2	7	3	1
E	5	3	9	5	1

Find out how men should be assigned the job in way that will minimize the total time taken.

Q7) a) Solve using simplex method [8]

$$\text{Max. } Z = 2X_1 + 5X_2$$

$$\text{Subject to, } X_1 + 4X_2 \leq 24$$

$$3X_1 + X_2 \leq 21$$

$$X_1 + X_2 \leq 9$$

$$X_1, X_2 \geq 0$$

b) Explain the rules for forming the dual. [8]

Construct dual of the problem:

$$\text{Max. } Z = 3X_1 + 10X_2 + 2X_3$$

$$\text{Subject to, } 2X_1 + 3X_2 + 2X_3 \leq 7$$

$$3X_1 - 2X_2 + 4X_3 = 3$$

$$X_1, X_2, X_3 \geq 0$$

OR

Q8) a) Use method of Big-M to solve the problem: [8]

$$\text{Max. } Z = X_1 + 2X_2 + 3X_3 - X_4$$

$$\text{Subject to, } X_1 + 2X_2 + 3X_3 = 15$$

$$2X_1 + X_2 + 5X_3 = 20$$

$$X_1 + 2X_2 + X_3 + X_4 = 10$$

$$X_1, X_2, X_3, X_4 \geq 0$$

b) Use two phase method to solve the problem: [8]

$$\text{Max. } Z = 3X_1 + 2X_2 + 2X_3$$

$$\text{Subject to, } 5X_1 + 7X_2 + 4X_3 \leq 7$$

$$-4X_1 + 7X_2 + 5X_3 \geq -2$$

$$3X_1 + 4X_2 - 6X_3 \geq 29/7$$

$$X_1, X_2, X_3 \geq 0$$

- Q9)** a) Find minimum of $f = X(X-1.5)$ in the interval $(0,1)$ within 10% accuracy by Dichotomous Search Method. [9]
 b) Use Fibonacci Method to Max. $F_x = X^3(12-X)$ in the interval $(0, 12)$ within 10% accuracy. [9]

OR

- Q10)** a) Max $Z = 6X_1 - 2X_1^2 + 4X_2 - 2X_2^2 - 2X_1X_2$ starting with $[1, 1]$ using steepest gradient method. [9]
 b) Max. $Z = 6X_1 - X_1^2 + 6X_2 - 3X_2^2$ Starting with $X_0 (2, 2)$ using Newton's Method. [9]

- Q11)** a) A distance network consists of 11 nodes which are distributed as shown in following table. Find the shortest path from node 1 to node 11 and the corresponding distance. [8]

Arc	Distance	Arc	Distance
1-2	5	5-8	9
1-3	8	5-9	6
1-4	9	6-9	7
2-5	3	7-10	4
3-6	10	8-11	6
3-7	12	9-11	5
4-7	5	10-11	2

- b) What is Dynamic programming? What sort of problem can be solved using it? Explain Bellman's Principle of Optimality. [8]

OR

- Q12)** a) It is proposed to develop hydropower by building dams across 3 possible river sites. The total financial resource available is 8 units. The return functions for each of possible investment are given below. The available resource is to be allocated optimally to these developments. Using resource allocation determines maximum return & give the allocation to various site. [8]

Resource Allocated	Return From Site		
	Site1	Site2	Site3
0	0	0	0
2	12	14	30
4	75	55	50
6	91	70	70
8	98	80	75

- b) Explain the assumptions in two person zero sum game. Also explain the theory of Dominance. [8]



Total No. of Questions : 10]

SEAT No. :

P3289

[5461]-506

[Total No. of Pages : 2

B.E. (Civil)

**ADVANCED CONCRETE TECHNOLOGY
(2015 Pattern) (End Sem.) (Elective - I) (401004C) (Semester - I)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Your answers will be valued as a whole.
- 5) Use of electronic pocket calculator is allowed.
- 6) Assume suitable data if necessary.
- 7) Use of IS code 10262, 456 is not allowed.

- Q1)** a) Write short note on gel-space ratio. [4]
b) Explain in brief the comparison between natural river sand and manufactured sand used in making concrete. [6]

OR

- Q2)** a) What is mean by green concrete? State the various materials used in green concrete. [4]
b) What are the guideline for quality control and quality assurance of concrete? How to check the quality of concrete in fresh and hardened state? [6]

- Q3)** a) Compare the high performance concrete and High strength concrete with respect to material, mechanical properties and elastic properties. [4]
b) Write short note on
 - i) Pervious concrete
 - ii) Vacuum concrete

OR

- Q4)** a) State advanced non-destructive testing methods. Explain any one in details. [4]
b) Explain step by step procedure to design the Self compacting concrete. [6]

- Q5)** a) Explain basic concept of Fibre reinforced concrete. Give examples of fibres suitable to improve [6]
 - i) flexural strength
 - ii) impact strength
 - iii) shear strength

P.T.O.

- b) Explain the behaviour of brittle fibre in brittle matrix and elastic fibre in brittle matrix. [6]
- c) Write short note on tensile behaviour of fibre reinforced concrete. [6]

OR

- Q6)** a) Explain the bending behaviour of fibre reinforced concrete. [6]
- b) Write short note on Steel fibre and Polypropylene fibres. [6]
- c) What is the effect of aspect ratio of fibres on workability and strength. [6]

- Q7)** a) Explain the behaviour of GFRC under tension, compression and flexure. [6]

- b) What is SIFCON? Explain the procedure to develop this material and its applications. [6]
- c) Explain interaction between fibre and matrix, un-cracked and cracked in flexure. [4]

OR

- Q8)** a) Explain the quality control test to be conducted on fibre reinforced concrete. [6]
- b) Explain the procedure to mix fibres in concrete. Why workability of concrete reduces with addition of fibres? [6]
- c) Give the examples of naturally occurring fibres and their applications? [4]

- Q9)** a) Compare ferrocement construction with RCC construction with respect to material, handling, shape, density, strength and ductile behaviour. [6]
- b) Explain the step by step procedure to construct ferrocement elements like wall and water tank. [6]
- c) Why rich mortar mix is used in the ferrocement construction? [4]

OR

- Q10)** a) Give the examples of precast concrete element available in market and its advantages and disadvantages with respect to on-site construction. [6]
- b) Explain close mould techniques of ferrocement construction. [6]
- c) Explain the manufacturing process of industrial precast pipes. [4]



Total No. of Questions : 8]

SEAT No. :

P3711

[Total No. of Pages : 2

[5461]-507

B.E. (Civil)

**ARCHITECTURE AND TOWN PLANNING
(2015 Pattern) (Elective - I)**

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if necessary.*

- Q1)** a) Enlist and explain any two qualities of Architecture and its outcome. [7]
b) Enlist the objectives and elaborate the importance of landscaping. [7]
c) Compare and contrast between Regional Plan and Development Plan. [6]

OR.

- Q2)** a) Explain the role of an urban planner and an architect in planning and designing of a town. [6]
b) What is sustainable architecture? Mention its importance in todays context. [7]
c) What are the goals and objectives of town planning? Elaborate by giving an example. [7]

- Q3)** a) Enlist and explain the different civic surveys carried out for development plan and its application. [8]
b) In what way, “Intelligent Transport System” is responsible for traffic management? [9]

OR

- Q4)** a) Explain in depth: organization and purpose for MHADA. [8]
b) By discussing hierarchy of roads , elaborate is significance in traffic management. Draw an explanatory sketch. [9]

P.T.O.

- Q5)** a) What are the objectives of LARR Act? Explain it. [8]
b) What are URDPFI Guidelines? Elaborate in relation with, “land use, infrastructure”? [8]

OR

- Q6)** a) What are the applications of URDPFI Guidelines? [8]
b) Write a note on, “ Real Estate (Regulation and Development)Act 2016”.[8]

- Q7)** a) “Planning in early days without special techniques”, comment on it. [9]
b) Write notes on : SEZ and CRZ. [8]

OR

- Q8)** a) Explain in depth: Application of GIS, GPS, remote sensing in planning.[9]
b) Write notes on : Smart City and AM RUT. [8]



Total No. of Questions : 6]

SEAT No. :

P3712

[Total No. of Pages : 3

[5461]-508

B.E. (Civil Engg.) (Semester - I)

**ADVANCED ENGINEERING GEOLOGY WITH ROCK
MECHANICS
(2015 Pattern) (Elective - I)**

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams should be drawn wherever necessary.

Q1) a) Describe field characteristics of Deccan Trap Basalt. [6]

OR

b) Describe the regional distribution of Deccan trap basalt. [6]

Q2) a) What do you mean by watershed development? How the soil erosion is prevented. [7]

OR

b) Explain process of decomposition in soil formation. [7]

Q3) a) Describe influence of geological factors upon urban development. [7]

OR

b) Write a note on compact basalt and amygdaloidal basalt as construction material. [7]

P.T.O.

- Q4)** a) Explain in brief RMR classification. [8]
 b) Calculate RQD recovery and Core recovery from following table. [8]

Run in m	Piece No.	Length in cm.	Nature of fracture
0 - 3 m	1	07	J
	2	15	J
	3	13	J
	4	08	J
	5	60	J
	6	13	J
	7	40	J
	8	08	J
	9	17	J
3 - 6 m	10	80	M
	11	90	M
	12	08	M
	13	110	J

OR

- a) What are various physical properties of rocks. [8]
 b) Calculate Apparent resistivity values at different depth zones. [8]

Sr. No.	R	a	$2\pi aR$
1	1.48	1	
2	1.55	2	
3	1.38	3	
4	1.50	4	
5	1.20	5	
6	1.67	10	

- Q5)** a) Explain in detail any two case histories of dam sites in Maharashtra, where tail channel erosion is occurring. [10]
 b) Write a note on Engineering significance of Tachylytic Basalt. [7]

OR

- a) Discuss relationship between local Geology and location of Spillway in Deccan Trap. [10]
- b) What treatment is to be given to a dyke occurring at a Dam site. [7]

- Q6)** a) Explain in detail engineering geological investigation for tunneling. [10]
b) Write note on location and depth of drill holes at foundation of bridge.[7]

OR

- a) Explain in detail engineering geological investigations for bridge foundation. [10]
- b) Whether the tunnels are suitable through limestone and quartzite. [7]



Total No. of Questions : 8]

SEAT No. :

P3290

[5461]-509

[Total No. of Pages : 4

B.E. (Civil Engineering)

MATRIX METHODS OF STRUCTURAL ANALYSIS

(2015 Pattern) (End Sem.) (Elective-II) (Semester-I)

Time : 2½ Hours]

[Max. Marks : 70

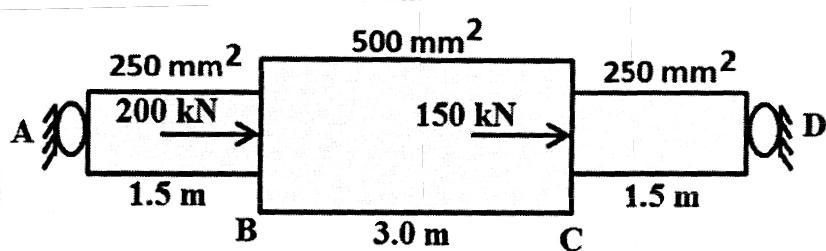
Instructions to the candidates:

- 1) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicates full marks.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data if necessary.

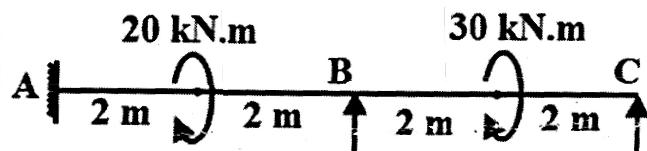
Q1) a) Write short note on: [6]

- i) Gauss Jordon Method
- ii) Gauss Seidel Method

b) Determine displacement at joint B and C in the bar structure as shown in figure using stiffness matrix method. Take E = 210 GPa. [6]



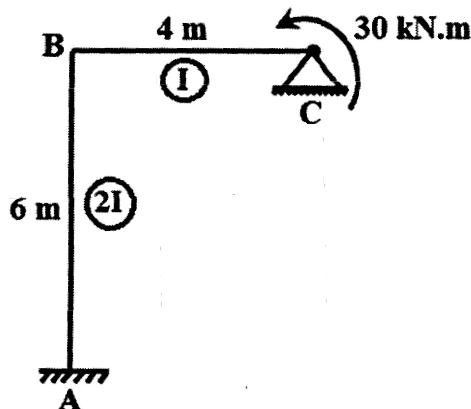
c) Determine support reactions of continuous beam ABC as shown in figure using flexibility matrix method. Take EI constant. [8]



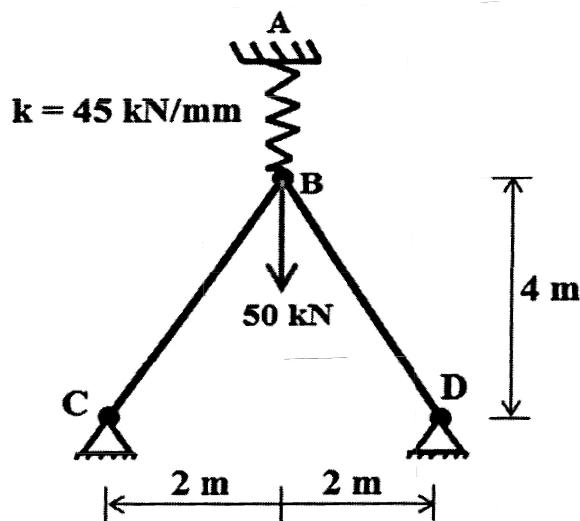
OR

P.T.O.

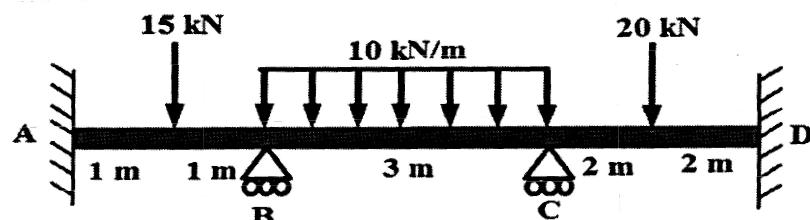
- Q2)** a) Write computer algorithms for following numerical methods. [6]
- Gauss Jordon Method
 - Gauss Seidel Method
- b) Determine support reactions of the portal frame ABC as shown in figure using flexibility matrix method. Take EI constant. [8]



- c) Determine deflections at loaded joint of the truss supported by spring at A. The stiffness of spring is 45 kN/mm. Take cross-sectional area of both the members 750 mm^2 and $E = 200 \text{ GPa}$. [6]

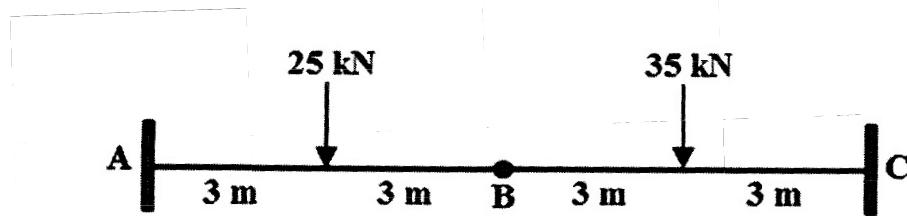


- Q3)** Analyze the continuous beam ABCD as shown in figure using structure approach of stiffness matrix method. Take EI constant. Draw BMD. [18]

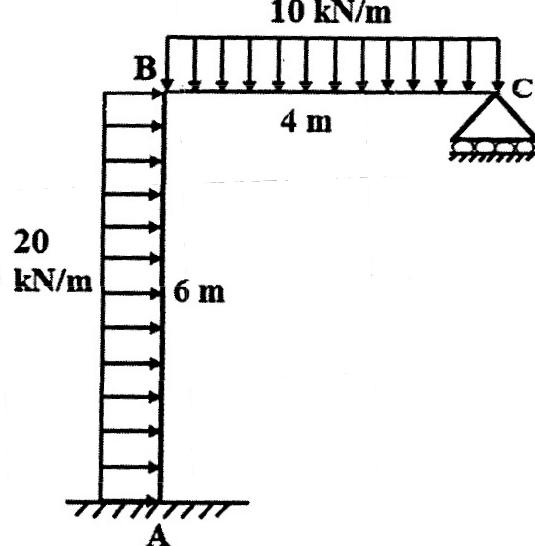


OR

- Q4)** Analyze the continuous beam ABC as shown in figure using member approach of stiffness matrix method. The beam is fixed at A, C and internal hinge at B. Take EI constant. Draw BMD. [18]

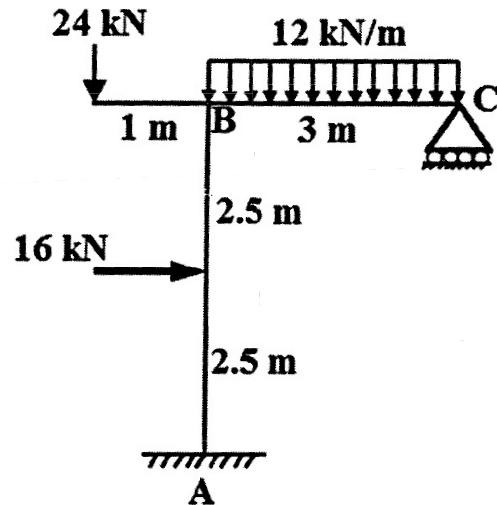


- Q5)** Analyze the portal frame ABC as shown in figure using structure approach of stiffness matrix method. Neglect axial deformation. Take EI constant. Draw BMD. [16]

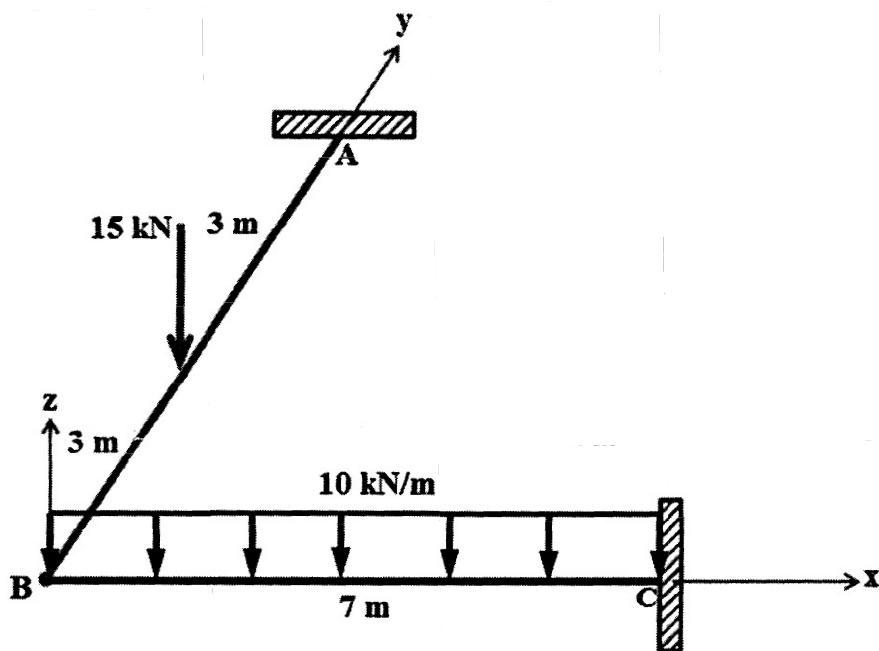


OR

- Q6)** Analyze the portal frame ABC as shown in figure using member approach of stiffness matrix method. Neglect axial deformation. Take EI constant. Draw BMD. [16]

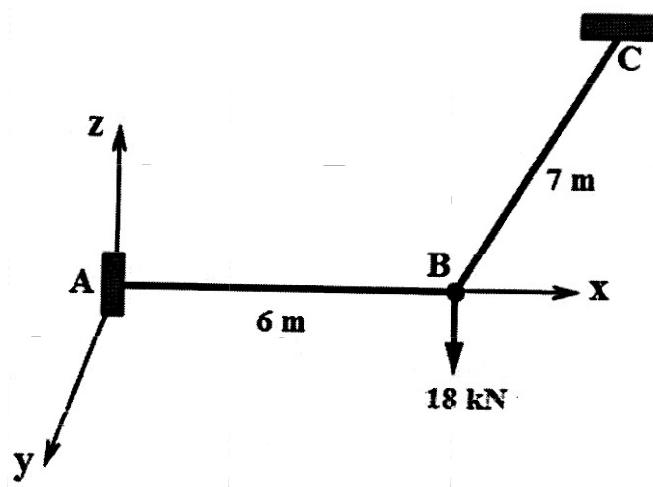


Q7) Determine moments and reactions of the two member grid structure as shown in figure using structure approach of stiffness matrix method. Take $EI = 0.4 \text{ GJ}$. [16]



OR

Q8) Determine moments and reactions of the two member grid structure as shown in figure using member approach of stiffness matrix method. $EI = 3000 \text{ kNm}^2$ and $GJ = 1500 \text{ kNm}^2$. [16]



→ → →

Total No. of Questions : 12]

SEAT No. :

P3291

[5461]-510

[Total No. of Pages : 2

B.E. (Civil)

INTEGRATED WATER RESOURCES PLANNING AND MANAGEMENT

(2015 Course) (End Sem.) (Elective-II) (Semester-I) (401005B)

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) *Answer any one from questions 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10, 11 or 12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

Q1) a) Write a note on : History of water resources development. [3]

b) How the use of rights for water is made? [3]

OR

Q2) a) Which are the water infrastructure-problems? [3]

b) What is meant by riparian rights? [3]

Q3) a) Write a note on : Water as economic good. [3]

b) Write a note on : Concepts of ‘Virtual Water’. [3]

OR

Q4) a) Write a note on : Financing of water resources project. [3]

b) Write a note on : Requirement of water for human and nature. [3]

Q5) a) What is meant by export of water? [4]

b) Write a note on : Different methods of drought forecasting. [4]

OR

Q6) a) How the Recycling and reuse of water can be done? [4]

b) How to do the assessment of flood damage? [4]

P.T.O.

- Q7)** a) Explain in detail necessity of water management in irrigation sector. [8]
b) Write a note on Estimation & forecasting of water demands of domestic & industrial sector. [8]

OR

- Q8)** a) How the irrigation water utilization is done? [8]
b) Write a note on estimation and forecasting of water demand for irrigation sector. [8]

- Q9)** a) Write a note on water quality management for various uses. [8]
b) Social impact of water resources development on Education & health. [8]

OR

- Q10)** a) How to protect the vital ecosystem by environmental management? [8]
b) Social impact of water resources development on agro-industry to enhance living standards. [8]

- Q11)** a) How the management of IWRM is carried out by use of data driven techniques like Genetic programming is done. [8]
b) Define Watershed. How the watersheds are classified? Explain integrated approach for watershed management. [10]

OR

- Q12)** a) How the management of (IWRM) by use of data driven techniques like Artificial Neural networks is done? [8]
b) Define RS & GIS. Write a role of RS & GIS in watershed management. [10]



Total No. of Questions : 10]

SEAT No. :

P3292

[Total No. of Pages : 2

[5461]-511

B.E. (Civil)

**TQM & MIS IN CIVIL ENGINEERING (401005 C)
(2015 Pattern) (Semester - I) (End sem.) (Elective - II)**

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) All questions are compulsory.
- 2) Figures to the right indicates full marks.

- Q1)** a) What are the various barriers affecting on the implementation of TQM in construction sector? [4]
b) Explain the contribution of any two QM Gurus highlight their views regarding Quality? [6]

OR

- Q2)** a) ‘Workmanship is important parameter of quality work’, comment. [4]
b) List out any four quality control tools and explain any two in detail. [6]

- Q3)** a) Write a note on Six Sigma in construction with respect to its advantages and limitations. [5]
b) What are the contents of quality manual? Describe its structure. [5]

OR

- Q4)** a) Enlist the principle of ISO 9001 and Explain any two? [5]
b) What is Six Sigma? Explain their certification levels. [5]

- Q5)** a) How the benchmarking is important role in TQM? [6]
b) Describe the main features and process of Quality Circle. [6]
c) Explain the flow of cost of quality. How it will be affect any construction project? [6]

OR

- Q6)** a) Explain with Example CONQAS. [6]
b) What do you mean by Quality Circle? List out its benefits. [6]
c) Write a note on CIDC-CQRA Certification? [6]

P.T.O.

- Q7)** a) Explain with Example 5 S techniques? [6]
b) What are the four elements of Zero defects explain with a suitable example. [6]
c) Explain the role of awards in TQM. [4]

OR

- Q8)** Write a note on (Any four) [16]

- a) FEMA.
- b) Jamuna lal bajaj award
- c) Zero defect
- d) Rajiv Gandhi National Quality Award
- e) Malcolm Baldrige National Quality Awards

- Q9)** a) Elaborate DSS with example and write their Advantages. [6]
b) Write a note on operation support system. [5]
c) What is meant by MIS? List out its objectives. [5]

OR

- Q10)** a) Explain advantages and limitations of MIS in implementation on construction site. [6]
b) Construction activities will effectively managed by using MIS, Justify. [5]
c) Differentiate between data and Information. [5]



Total No. of Questions : 12]

SEAT No. :

P3293

[Total No. of Pages : 3

[5461]-512

B.E. (Civil)

EARTHQUAKE ENGINEERING

(2015 Pattern) (Semester - I) (End sem.) (Elective - II)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.
- 2) Figure to the right indicator full marks.
- 3) Use of IS 456, IS 1893 and non programmable calculator is allowed.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) If necessary assume suitable data and clearly mention the same.

Q1) a) What do you mean by Convection Current. [4]

b) Describe in brief interior structure of earth. [6]

OR

Q2) a) Explain the Plate Tectonic Theory. [4]

b) Explain in details Intensity (with Modified Mercalli Scale) and magnitude (Richter's scale). [6]

Q3) Classify vibration according to Direction and Characteristic point of view. [6]

OR

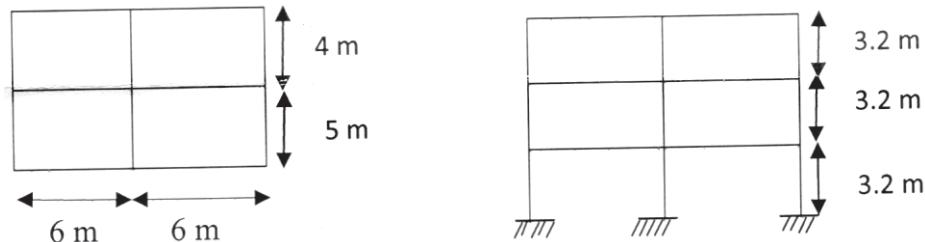
Q4) A weightless steel cantilever beam 0.6 m long has cross section of 40 mm deep and 15 mm wide. It supports a load of 750 N at the tip. Determine the natural frequency and natural period of vibration and derive formula used. [6]

Q5) Summarized philosophy of seismic design. [6]

OR

P.T.O.

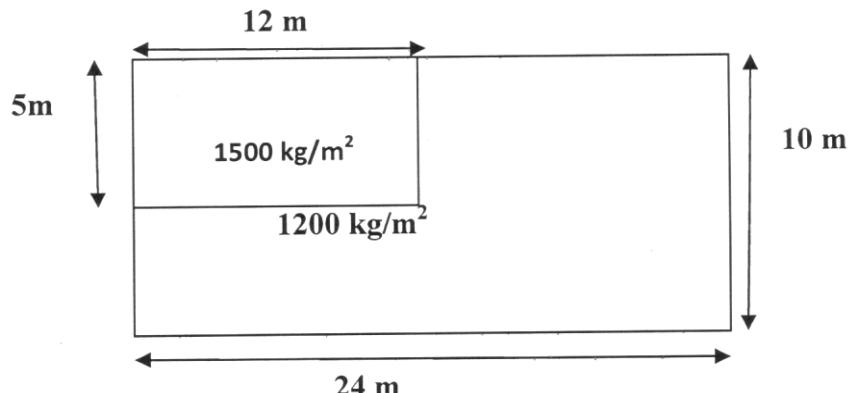
- Q6)** The plan and elevation of three story RC building located in pune is shown in fig. the building consist of OMRF and rests on hard soil. Seismic weight on roof 865 kN and each floor 1190 kN. Calculate base shear. [6]



- Q7)** Explain effect of irregularities and building architecture on the performance of RC structure in an earthquake. [16]

OR

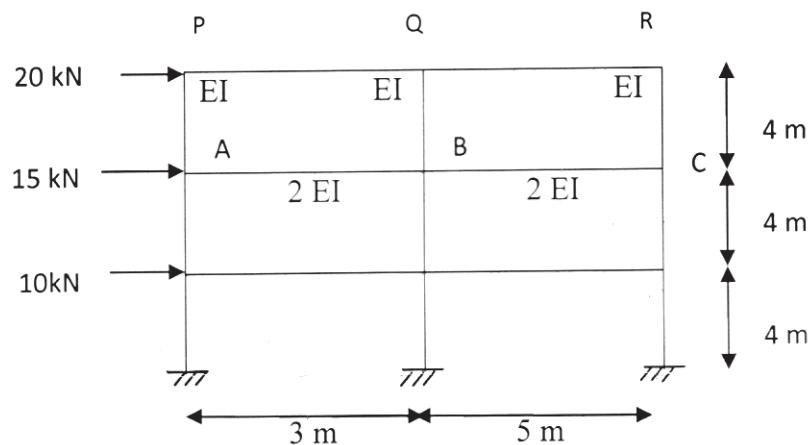
- Q8)** a) Write short note on ‘Response Spectra’ and ‘effect of shear wall’. [8]
 b) A building having non-uniform distribution of mass is shown in figure. Locate its center of mass. [8]



- Q9)** a) Explain with neat sketches the ductile detailing of beam column joint. [8]
 b) Explain the procedure for estimation of combined effect of lateral forces and vertical loading on multistory frame. [8]

OR

- Q10)** a) Analyze the multistoried building frame as shown in fig by portal method for lateral loads. The dead load and total design load acting on beam AB are 13 kN/m and 28 kN/m respectively and 19 kN/m and 42 kN/m over beam BC. The relative stiffness of beam is double than the column stiffness. Analysis the beam ABC for vertical load by substitute frame method. Calculate maximum span moment at BC. Design beam section (BC) for combined effect of vertical load and horizontal loads 10% redistribution of moment is permitted for vertical load moments. Use M20 and Fe 415. [16]



- Q11)a** Explain need of Isolation. Why the base isolation is effective. [8]
b) What are disaster management and explain qualities of rescuer. [8]

OR

- Q12)a** Explain strengthening of slab and wall for RCC building. [8]
b) Explain need of retrofitting. [8]



Total No. of Questions : 10]

SEAT No. :

P3713

[Total No. of Pages : 2

[5461]-513

B.E. (Civil)

ADVANCED GEOTECHNICAL ENGINEERING
(2015 Pattern) (Elective - II) (Semester - I)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Use of electronic pocket calculator is allowed in the examination.
- 5) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Explain the soil classification based on the grain size and plasticity. [5]
b) Explain with suitable diagram. [5]
i) Flocculated Structure
ii) Dispersed Structure

OR

- Q2)** a) Explain in detail timbering and bracings for open cut [5]
b) Distinguish between “at rest”, active and passive earth pressure. Derive the expression for the coefficient of “at rest” earth pressure K_o . [5]

- Q3)** a) Explain in detail coulomb theory of earth pressure. [5]
b) Explain different properties and functional requirements of geosynthetics. [5]

OR

- Q4)** a) Determine the active resultant thrust at a depth of 7m in sand whose angle of friction is 25° and density of 17 kN/m^3 in dry state. [5]
b) What do you mean by Reinforced Earth? Give advantages of reinforced earth structures. [5]

P.T.O.

Q5) a) Explain the following. [3 × 4 = 12]

- i) Soil as a mass spring system
- ii) Forced Vibrations
- iii) How dynamic load differ from static load

b) Explain different types of machine foundations. [4]

OR

Q6) a) Enlist different methods of analysis of machine foundation and explain any one. [8]

b) Discuss the design criteria for impact type machine as per IS 2974 – Part 11-1966. [8]

Q7) a) Explain following terms : [2 × 4 = 8]

- i) Compaction by dynamic loads.
- ii) Ground improvement by excavating and replacing of soil.

b) Explain following terms : [2 × 4 = 8]

- i) Ground improvement by stone column.
- ii) Different methods of grouting.

OR

Q8) a) Explain the steps for design of sand drains : [2 × 4 = 8]

- i) Isotropic case
- ii) Anisotropic case

b) Explain the steps for vibrofloation with inserting reinforcement with neat sketch. [8]

Q9) a) Explain the concept of Rheology and Rheological model. [6]

b) Explain viscous model with spring and dashpot. [6]

c) Discuss creep by giving suitable example. [6]

OR

Q10) a) Explain basic and composite Rheological model. [6]

b) Explain in detail secondary consolidation. [6]

c) What are the limitations of Rheological models? [6]



Total No. of Questions : 8]

SEAT No. :

P3668

[Total No. of Pages : 2

[5461]-521
B.E. (Mechanical)
HYDRAULICS AND PNEUMATICS
(2015 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.

- Q1)** a) Compare the characteristics and application of hydraulic and Pneumatic drive. [6]
b) With a neat sketch explain the working of pressure intensifier and list application. [6]
c) A Pump having a displacement volume of $14 \text{ cm}^3/\text{rev}$. runs at 2000 r.p.m. It operates against a maximum system pressure of 150 bar. The volumetric & over all efficiency of the pump are 0.90 and 0.80 respectively. Determine. [8]
i) Actual power required to drive the pump.
ii) Input power required to drive the pump.
iii) The drive torque at the pump shaft.

OR

- Q2)** a) State & explain governing laws used in fluid power system in details. [6]
b) Explain with a neat sketch the construction and working of a typical hydraulic cylinder. [6]
c) Explain in brief any two different sources of contamination in a hydraulic system? State any two remedial measures. [8]

- Q3)** a) With neat sketches explain the advantages of tandem centre over a closed center design in a DCV. [6]
b) Explain with neat sketch working of pressure reducing valve draw an ISO symbol of it. [6]
c) Draw a pressure compensated flow control valve and explain it's working. [6]

OR

P.T.O.

- Q4)** a) Draw a hydraulic circuit for cylinder synchronization with two cylinders connected in parallel. State if it will give perfect synchronization. [6]
b) Draw a neat sketch of pump unloading circuit. State function of unloading valve. [6]
c) What is the function of pilot operated check valve. Draw the circuit involving pilot operated check valve. [6]

- Q5)** a) Draw and explain throttle-out circuit used in pneumatics. [6]
b) Draw and explain position dependent sequencing circuit for two cylinders in pneumatics. [6]
c) Explain the need of using FRL unit in pneumatic system. Also draw its detail symbol. [4]

OR

- Q6)** a) Draw and explain the hydraulic motor breaking circuit. [6]
b) Draw and explain the time delay circuit used in pneumatic system. [6]
c) What is the purpose of providing ‘pressure regulator’ in pneumatic circuits? [4]

- Q7)** a) Design the hydraulic circuit for the following operations :
The circuit is required for press operation. An accumulator will supply the necessary flow once the power is shut off by the pressure switch at the end of advance stroke. Locate the pressure relief valve, check valve & other essential components of the circuit. Describe the operation of the circuit. Indicate the function of the accumulator during the operation. [12]

- b) List four important considerations to be taken into account while designing a hydraulic circuit. [4]

OR

- Q8)** a) A double acting cylinder is to be operated continuously to & fro. Draw a hydraulic circuit without solenoid valves and explain the operation. [12]
b) Write the essential steps to design a fluid . [4]



Total No. of Questions : 10]

SEAT No. :

P3714

[Total No. of Pages : 3

[5461]-522

B.E. (Mechanical)

CAD/CAM & AUTOMATION

(2015 Pattern) (End Semester)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q 1 or Q 2, Q 3 or Q 4, Q 5 or Q 6, Q 7 or Q 8, Q 9 or Q 10.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of scientific calculator allowed.
- 5) Assume suitable data if necessary.

Q1) a) Derive transformation Matrix for rotating any point at origin about Z-axis in X-Y Plane. Determine transformed coordinates of point P(4, 5) when rotated about Z-axis at origin by 30° in clockwise direction. [5]

b) What is Inverse Transformations. Discuss with suitable example. [5]

OR

Q2) a) Compare Bezier and B-Spline curves with neat sketch. [5]

b) Discuss p and h formulation for meshing with suitable example. [5]

Q3) a) Line L₁ is passing through points P₁ (1, 7) and P₂ (7, 2). Determine parametric equation of a line and coordinates of five equispaced points on the line. [5]

b) Compare CSG and B-rep techniques in solid modeling. [5]

OR

Q4) For the step bar shown in figure 1, Find stress and deformation in elements, reaction at support using 1D elements, if temperature is increased by 40°C. Consider E = 210 GPa, $\alpha = 12 \times 10^{-6}$ per °C and P = 10 kN. [10]

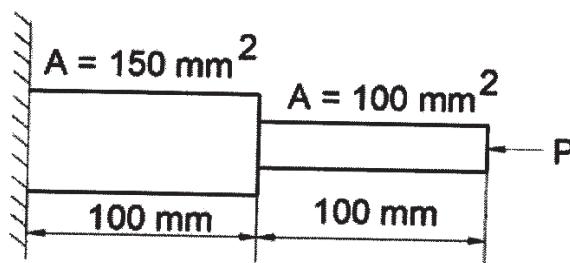


Figure 1:

P.T.O.

- Q5)** a) Write CNC program using G and M codes with suitable CANNED CYCLES to turn the mechanical component shown in figure 2 from bar stock of ϕ 38 mm. Assume suitable cutting data. [12]

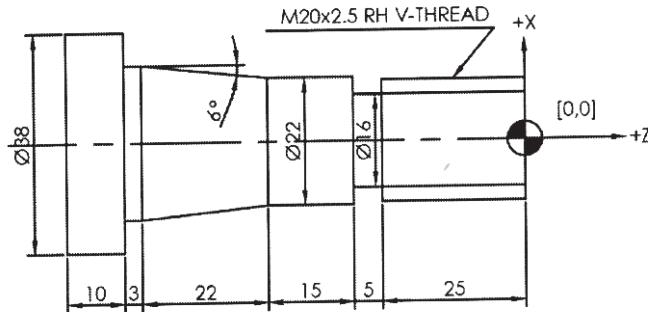


Figure 2:

- b) Discuss steps in CNC part programming. [6]

OR

- Q6)** a) Write CNC program using G and M codes to Face mill, contour the component, also drill holes for sketch shown in figure 3. Use subroutine wherever applicable. Thickness of blank is 25 mm. Assume suitable data for speed and feed. [12]

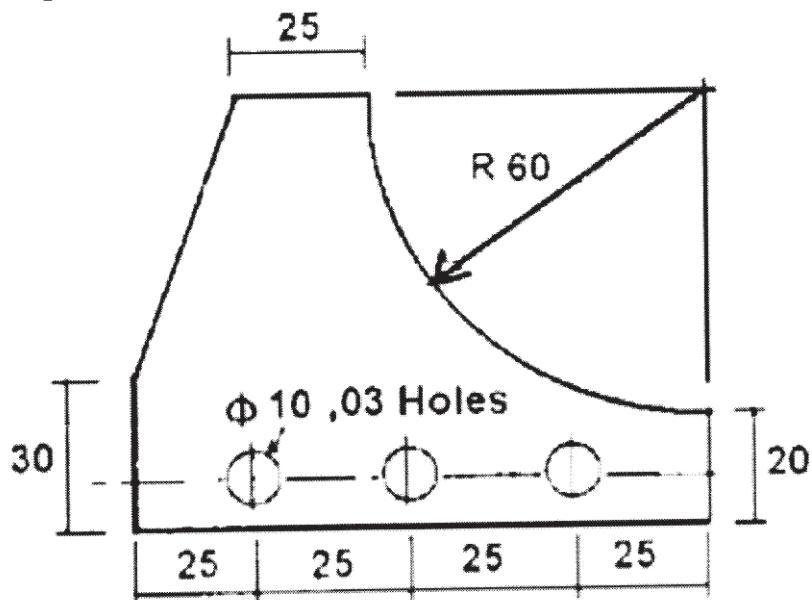


Figure 3:

- b) Explain canned cycles for following operations on horizontal machining center.
- [6]
- Threading
 - Parting

- Q7)** a) What is PLM? Discuss various components of PLM. [8]
b) Explain Fused Deposition Modeling process with neat sketch and state its applications. [8]

OR

- Q8)** a) Explain Rapid Tooling and Rapid Prototyping [8]
b) Discuss Collaborative Engineering. [8]

- Q9)** a) Discuss advantages of Computer Aided Process Planning. [8]
b) List coding systems of Group Technology and explain any one in detail. [8]

OR

- Q10)** a) Discuss Hard and Soft Automation. [8]
b) Explain robot anatomy with neat sketch. [8]



Total No. of Questions : 10]

SEAT No. :

P3294

[Total No. of Pages : 3

[5461]-523

B.E. (Mechanical)

Dynamics of Machinery (402043)
(2015 Course) (Semester-I) (End Sem.)

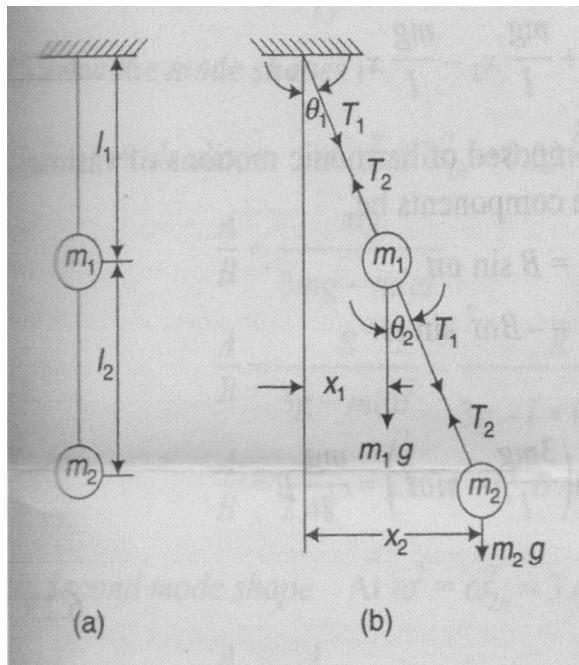
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Draw neat diagrams wherever necessary.
- 3) Use of scientific calculator is allowed.
- 4) Assume suitable data where ever necessary.
- 5) Figures to the right indicate full marks.

Q1) Find the natural frequency of oscillations of the double pendulum as shown in following fig. where $m_1 = m_2 = m$ and $l_1 = l_2 = l$. Draw mode shapes and locate the nodes for each mode of vibration. [10]



OR

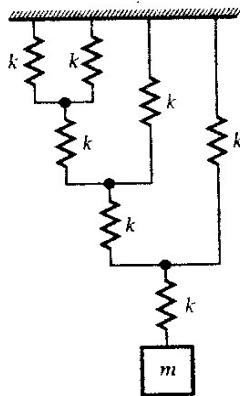
Q2) a) Explain frequency response curve with neat labeled diagram. [5]

P.T.O.

- b) Find the natural frequency of the system shown in following fig.

Take $K = 2 \times 10^5 \text{ N/m}$ and $m = 20 \text{ kg}$.

[5]



- Q3)** The static deflection of an automobile on its springs is 100 mm. Find the critical speed when the automobile is travelling on a road, which can be approximated by a sine wave of amplitude 80 mm and a wavelength of 16 m. Assume the damping to be given by (damping ratio : 0.05) also determine the amplitude of vibration at 75 km/hr.

[10]

OR

- Q4)** a) Explain following terms: [4]
 i) Zero frequency deflection
 ii) Node point
- b) A body of mass 5 kg is supported on a spring of stiffness 1960 N/m and has a dashpot connected to it which produces a resistance of 1.96 N at a velocity of 1 m/sec. In what ratio will the amplitude of vibration be reduced after 5 cycles. [6]

- Q5)** a) A rotating shaft carries three unbalanced masses of 4 kg, 3 kg and 2.5 kg at radial distances of 75 mm, 85 mm and 50 mm and at the angular positions of 45° , 135° and 240° respectively. The second and the third masses are in the planes at 200 mm and 375 mm from the plane of the 1st mass. The angular positions are measured counter clockwise from the reference line along x axis and viewing the shaft from the first mass end. The shaft length is 800 mm between bearings and the distance between the plane of 1st mass and the bearing at that end is 225mm. Determine the amount of counter masses in plane at 75 mm from the bearings for the complete balance of the shaft. The first counter mass is to be in a plane between the first mass and the bearing at a radius 75 mm. The second mass is in a plane between the third mass and the bearing at that end at a radius 40 mm. [14]
 b) Explain direct and reverse crank method with neat diagram. [4]

OR

- Q6)** a) Each crank and the connecting rod of a six cylinder four stroke in line engine are 60 mm and 240 mm respectively. The pitch distances between the cylinder centre lines are 80 mm, 80mm 100 mm, 80 mm and 80 mm respectively. The reciprocating mass of each cylinder is 1.4 kg. The engine speed is 1000 rpm. Determine the out of balance primary and secondary forces and couples on the engine, if the firing order be 1-4-2-6-3-5. Take a plane midway between the cylinders 3 and 4 as the reference plane. [14]
 b) Why single cylinder engine cannot be completely balanced? [4]

- Q7)** a) Explain condition monitoring of machines. Explain different techniques for it. [6]
 b) A seismic instrument is used to find the displacement, velocity and acceleration of a machine running at 250 rpm. If the natural frequency of instrument is 5 Hz and it records the displacement 5 mm, find the displacement, velocity and acceleration of vibrating machine assuming no damping. [6]
 c) Explain the working of FFT Analyzer. [4]

OR

- Q8)** a) Explain working of Magneto - Rheological dampers with neat sketch and application. [6]
 b) A vibrometer with a natural frequency of 2 Hz and with negligible damping is attached to a vibrating system which performs a harmonic excitation. Assuming the difference between the maximum and minimum recorded values are 0.6 mm determine the amplitude of motion of the vibrating system when its frequency is 20 Hz and 4 Hz. [6]
 c) Explain ISO standards used in vibration. [4]

- Q9)** a) Show that if the sound pressure is doubled, then the sound pressure level increases by almost 6 dB. [6]
 b) State and explain various types of sound fields? [6]
 c) Noise at the construction site is contributed by a few construction activities such as Piling work:104 dB, Scraper : 93 dB, Bulldozer : 94 dB, Mobile compressor: 73 dB and Mechanical Shovel: 76 dB on A weighing network. What is the overall sound pressure level? [4]

OR

- Q10)**a) Explain acoustic material & its characteristics. [6]
 b) Explain in brief various sources of noise and how to control the same. [6]
 c) Determine the sound pressure level of a source that generate a following rms sound pressure.
 i) 1.7 N/m^2
 ii) 0.7 Pa [4]



Total No. of Questions : 10]

SEAT No. :

P3715

[Total No. of Pages : 4

[5461]-524

B.E. (Mechanical)

FINITE ELEMENT ANALYSIS

(2015 Pattern) (Elective - I)

Time : 2½ Hours

[Max. Marks : 70

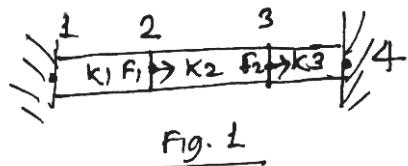
Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of scientific calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) What are the different steps of FEM? Explain each of them briefly. [6]
b) Explain the term shape function. Write the properties of shape function. [4]

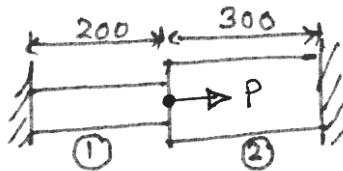
OR

- Q2)** a) State different types of Analysis used in Finite Element Analysis. Explain any one of them briefly. [4]
b) Three bar elements assembled colinear as shown in Fig.1. Nodes 1 and 4 are fixed and axial loads of 10 kN and 20 kN are applied at nodes 2 and 3 respectively. Determine the displacements at node 2 and 3. Assume length of each element as one metre. Stiffness as 1200 kN/m, 1800 kN/m, 1500 kN/m for 1, 2 and 3rd element respectively. [6]



P.T.O.

- Q3)** a) An axial load $P = 400 \times 10^3$ N is applied as shown at 20°C to the rod as shown in Fig. 2. The temperature is then raised to 60°C . Determine the elemental stress. [6]



$$E_1 = 70 \times 10^9 \text{ N/mm}^2$$

$$A_1 = 900 \text{ mm}^2$$

$$\alpha_1 = 23 \times 10^{-6} \text{ per } ^\circ\text{C}$$

$$E_2 = 200 \times 10^9 \text{ N/mm}^2$$

$$A_2 = 1200 \text{ mm}^2$$

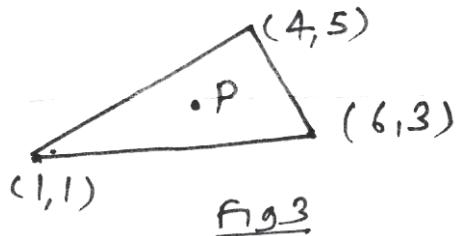
$$\alpha_2 = 11.7 \times 10^{-6} \text{ per } ^\circ\text{C}$$

Fig.2.

- b) Explain the term plain strain formulation and its importance. [4]

OR

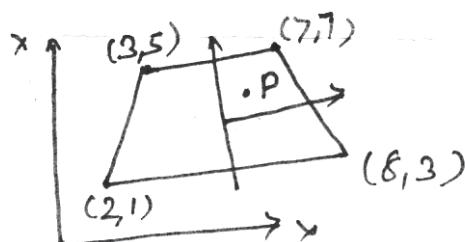
- Q4)** a) A triangular element with cartesian coordinate as shown in Fig. 3. The shape functions at an interior point 'p' is 0.2, 0.3 and 0.5 respectively. What are the coordinates of point 'p'. [4]



- b) Explain the term compatibility and completeness requirement in case of 2D elements. [6]

- Q5)** a) Explain the concept of iso-parametric, subparametric and superparametric elements. [9]

- b) Determine the cartesian coordinate of the point p ($\xi = 0.5$, $\eta = 0.6$) as shown in Fig. [9]



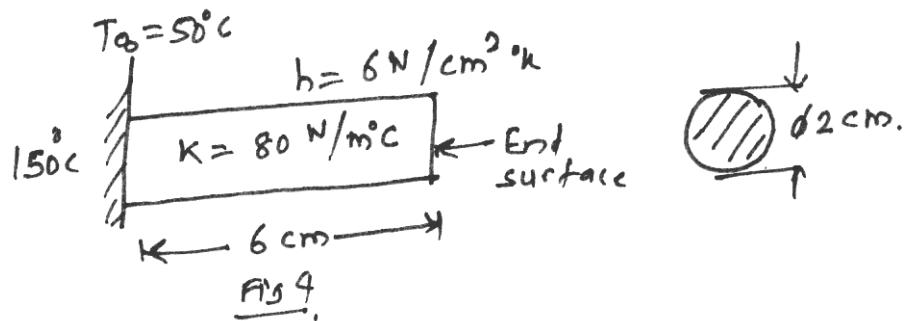
OR

- Q6)** a) Explain the terms ‘substructuring and submodelling’. [6]
 b) Compute the following integral by 2 point Gauss quadrature method. [6]

$$I = \int_{-1}^1 \int_{-1}^1 (r^2 + 2rs + s^2) dr ds$$

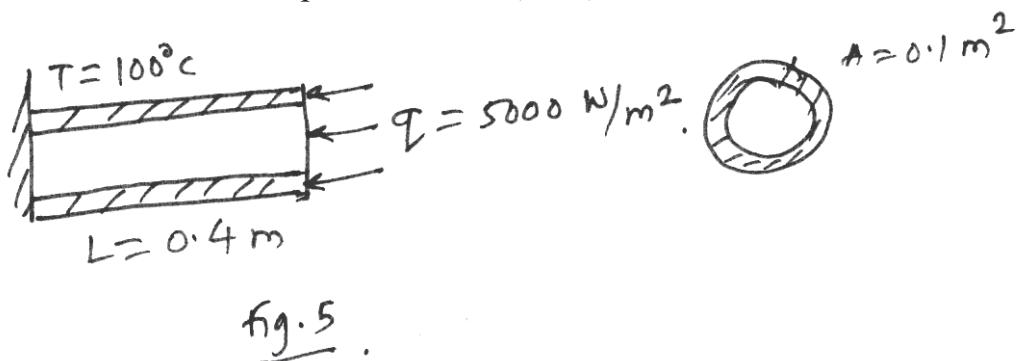
- c) Define the terms : [6]
 i) Aspect ratio.
 ii) Skewness.
 iii) Warp Angle.

- Q7)** a) Write down governing equation of steady state heat transfer and also write down elemental stiffness matrix and compare with bar element. [6]
 b) Find the temperature distribution in the one dimensional rod as shown in fig. 4. [10]

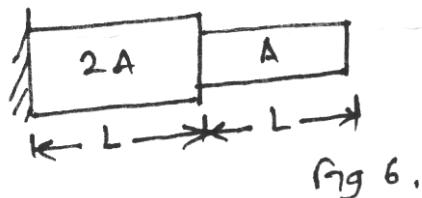


OR

- Q8)** a) Derive FEA stiffness matrix for pin Fin Heat transfer problem. [6]
 b) The fin shown in Fig. 5 is insulated on the perimeter. The left end has a constant temperature of 100°C. A positive flux of $q = 5000 \text{ W/m}^2$ acts on the right end. Let $K_{xx} = 6 \text{ W/m°C}$ and cross sectional area $A = 0.1 \text{ m}^2$. Determine the temperature at $L/4$, $L/2$, $3L/4$ and L where $L = 0.4 \text{ m}$. [10]



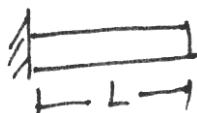
- Q9)** a) Write down Consistent mass and Lumped Mass Matrix for. [6]
 i) Bar element.
 ii) Plane Stress Element.
- b) Find the natural frequencies of longitudinal vibrations of the same stepped shaft of areas $A = 1000 \text{ mm}^2$ and $2A = 2000 \text{ mm}^2$ and of equal lengths ($L = 1\text{m}$), when it is constrained at one end, as shown below. [10]



OR

- Q10)** Find the natural frequency of vibration using consistent and lumped mass matrix method with one element to bar. [16]

$$E = 2 \times 10^{11} \text{ N/m}^2, \rho = 7800 \text{ kg/m}^3, L = 1\text{m.}$$



Total No. of Questions : 10]

SEAT No. :

P4228

[Total No. of Pages : 2

[5461]-525

B.E. (Mechanical)

COMPUTATIONAL FLUID DYNAMICS

(2015 Pattern) (Semester - I) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Explain divergence of velocity. Explain the physical significance of it with suitable example. [4]
- b) Write the Transport equation in differential form and explain the significance of each term. [6]

OR

- Q2)** a) Find the divergence of $\phi = \mathbf{V}(u, v, w) = (2x, 3xy, 5xz)$. [6]
- b) Explain in detail Dirichlet and Robins boundary conditions. Draw neat sketches. [4]

- Q3)** a) Differentiate between implicit methods and explicit methods. [4]
- b) Derive the discretized form of the steady, one-dimensional, heat conduction equation. [6]

OR

- Q4)** a) Short note on first order upwind (FOU) scheme. [4]
- b) What is stability of a numerical solution? How it is implemented in the first order upwind scheme. [6]

P.T.O.

- Q5)** a) Derive an expression for numerical solution of two-dimensional convection-diffusion system using suitable approach. [10]
 b) Define Peclet number and state its importance? [4]
 c) Differentiate between FDM and FVM. [4]

OR

- Q6)** a) Show that for two dimensional convective-diffusive equation the CFL condition should be less than or equal to 0.5 for system to remain stable, [10]

$$\frac{\partial \phi}{\partial t} + u \frac{\partial \phi}{\partial x} + v \frac{\partial \phi}{\partial y} = v \left[\frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} \right]$$

- b) Derive an expression for numerical solution of two-dimensional convection-diffusion system using upwind approach. [8]

- Q7)** a) What are the difficulties in solving Navier-Stokes Equations numerically? Discuss the remedy over the difficulties. Draw and discuss required control volumes. [10]
 b) Write down the steps taken for solving a problem of an external incompressible flow over an airfoil. [6]

OR

- Q8)** a) What is a simple Lid driven cavity problem? Explain the boundary conditions with a neat sketch. Write an algorithm for the same. [10]
 b) Write down the steps taken for solving a problem of an external incompressible flow over a flat plate using any software tool. [6]

- Q9)** a) Why turbulence modeling is required? Explain any one ‘two-equation’ turbulence model. [10]
 b) Write a note on mixing length theory. [6]

OR

- Q10)** a) Explain Eddy viscosity and its relevance with turbulence modeling. [8]
 b) Write in detail CFD analysis process for numerical solution of flow through pipe. [8]



Total No. of Questions : 10]

SEAT No. :

P3716

[Total No. of Pages : 3

[5461]-526

B.E. (Mechanical)

**HEATING VENTILATION AND AIR-CONDITIONING
(2015 Pattern) (Elective - I)**

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *All the three questions should be solved in one answer book and attach extra supplements if required.*
- 3) *Draw diagrams wherever necessary.*
- 4) *Use of scientific calculator is allowed.*
- 5) *Assume suitable data wherever necessary.*

Q1) In HFC-134a 1 TR ejector refrigeration system, the motive vapour is saturated at 80°C has following data : [10]

- a) Temperature of in the evaporator = -5°C
- b) The pressure at which the condenser is operated 10 bar
- c) Nozzle efficiency = 86%
- d) Entrainment efficiency = 64%
- e) Compression efficiency = 80%
- f) Quality of refrigerant at the beginning of compression = 0.96

Determine the following :

- i) Mass of motive fluid required per kg of secondary fluid
- ii) The quantity of secondary fluid
- iii) Refrigerating effect per kg
- iv) COP of the system

OR

Q2) a) Explain parallel compression transcritical system. [6]
b) Discuss classification of cooling tower. [4]

P.T.O.

- Q3)** A two cylinder single acting reciprocating compressor with 5% clearance is used in a R 22 refrigeration cycle to take refrigeration capacity of 7.2 TR at 5°C (3.6 bar) refrigeration temp. & 40°C (9.6 bar) condensing temperature. The compressor index is 1.15. The speed of the piston is limited to 3 m/s. Take L/D = 0.8 specific volume as 0.0525 m³/kg. [10]

Determine :

- a) power
- b) Volumetric efficiency
- c) COP
- d) Bore & stroke
- e) RPM

Temp.	PT	h_f	h_g
5°C	3.6	40.69	189.65
40°C	9.6	74.59	203.2

OR

- Q4)** a) Draw various arrangements of suction line. [4]
 b) Discuss the various methods of capacity controls of centrifugal compressor. [6]

- Q5)** a) Write a short note on “thermodynamics of human body” and explain comfort-discomfort diagrams with neat sketch. [8]
 b) The following table shows the measurements made at 9 points in the occupied zone of an air conditioned building. Evaluate the design parameters of the air distribution system. Consider Supply air temperature as 17°C and exhaust temperature as 25°C. [8]

Measuring point	DBT (°C)	Air velocity (m/s)
1.	24.1	0.3
2.	23	0.25
3.	24	0.16
4.	22.3	0.21
5.	23.1	0.1
6.	22.5	0.09
7.	21.7	0.11
8.	24.1	0.19
9.	20.4	0.24

OR

- Q6)** a) Discuss types of air distribution devices. [8]
 b) State factors affecting thermal comforts. [8]

- Q7)** a) A 25 cm thick wall is exposed to the periodic temperature and incident radiant variation on an hourly basis between 7 am and 6 pm is given in the table. Determine average heat gain of the room per unit area of the wall. The outdoor maximum and minimum temperatures are 40°C and 22°C respectively. The outside and inside design temperatures are 40 and 25°C respectively. What is the maximum heat gain and time of maximum heat gain from the wall? [12]

Density of material, $\rho = 2400 \text{ kg/m}^3$

Thermal conductivity, $k = 1.5 \text{ W/mK}$

Outside wall coefficient, $h_o = 23 \text{ W/m}^2\text{K}$

Inside wall coefficient, $h_i = 7 \text{ W/m}^2\text{K}$.

Time	7 am	8 am	9 am	10 am	11 am	12 noon	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm
Wall Mass (kg/m^2)	Equivalent Temperature Difference (ΔT_E) °C											
500	3.9	3.3	3.3	3.3	3.3	3.3	3.9	4.4	5.5	6.7	9.4	11.1
600	6.1	5.5	5.0	4.4	4.4	4.4	5.0	5.5	5.5	5.5	6.1	6.7

- b) Write a short note on : [6]
 i) Sol-air temperature
 ii) Air Spaces.

OR

- Q8)** a) Explain Energy Conservation Building Code. [8]
 b) Explain the term “Decrement factor & time lag”. [10]

- Q9)** a) Explain with schematic diagram Indirect Evaporative-Cooling Air Conditioning Systems. [8]
 b) Draw and explain water-to-water heat pump circuit. [8]

OR

- Q10)** a) Write a short note on “Clean Room”. [8]
 b) Explain Hybrid Desiccant air-conditioning system. [8]



Total No. of Questions : 10]

SEAT No. :

P3717

[Total No. of Pages : 2

[5461]-527

B.E. (Mechanical) (Semester - I)
AUTOMOBILE ENGINEERING (Elective - II)
(2015 Pattern)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of electronic pocket Calculator is allowed.
- 5) Assume Suitable data, if necessary.

- Q1)** a) Draw a layout of automobile chassis and explain parts of it. [5]
b) Describe the current scenario and development in Indian auto industry. [5]

OR

- Q2)** a) Explain the purpose and requirement of Front axle beam. [5]
b) Describe the necessity of gear box in automobile. [5]

- Q3)** a) Explain construction of wheel. What are benefits to use alloy wheels, Explain. [5]
b) Explain the following concepts used in steering geometry. [5]
i) Toe in Toe out.
ii) Understeer and Over steer.

pOR

- Q4)** a) What are the functions and objectives of Suspension system? Explain. [5]
b) Explain construction and working of hydraulic Brake system. What are various parts of it? [5]

P.T.O.

Q5) a) Describe role of active safety and passive safety in automobile with suitable example. [8]

b) Describe in detail parameters responsible for vehicle performance. [8]

OR

Q6) Write short note on the following (Any Four) : [16]

- a) Air bags.
- b) Seat belt.
- c) Power requirement for propulsion of vehicle.
- d) NVH in automobile.
- e) Stability of vehicle.

Q7) a) Explain with neat sketch principle and construction of lead-acid battery. [8]

b) Explain the working of electrical fuel pump. [8]

OR

Q8) a) Explain types of vehicle maintenance. [8]

b) What is a hybrid vehicle? Describe the layout of electric vehicle and explain various components of it. [8]

Q9) a) Describe various Tests on battery condition. [9]

b) What are the sensors and actuators used in automobiles? Describe the purpose of each. [9]

OR

Q10) Write short note on the following (any three) : [18]

- a) Overhauling of automobile engine
- b) Electric Horn
- c) Maintenance of steering system
- d) Role of Seat belt in vehicle safety.



Total No. of Questions : 12]

SEAT No. :

P3296

[Total No. of Pages : 2

[5461]-529

B.E. (Mechanical)

ENERGY AUDIT AND MANAGEMENT

(2015 Pattern) (Semester - I) (Elective - II) (402045 C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 or Q9 or Q10, Q11 and Q12.
- 2) Draw Neat diagrams wherever necessary.
- 3) Use of steam Table and Mollier Chart is allowed.
- 4) Assume suitable data where ever necessary.
- 5) Figures to the right indicate full marks.
- 6) Use of scientific calculator is allowed.

- Q1)** a) What is the need of renewable energy in Indian energy sector? Enlist the sources of renewable energy. [5]
b) What are the energy consumption patterns of industry, agriculture and residential sectors in India? [5]

OR

- Q2)** a) What is energy policy? Write the procedure to define the energy policy. [6]
b) Write the short note on energy reforms. [4]
- Q3)** a) What is the need of energy audit? List down its different types. [5]
b) Elaborate the provisions of current energy conservation act. [5]

OR

- Q4)** a) How the reporting of energy audit carried out. [4]
b) Give in detail the energy audit methodology for any manufacturing industry. [6]
- Q5)** a) Explain the sensitivity and risk analysis. [4]
b) Calculate NPV of project whose initial cost is Rs. 50,000 and gives annual saving of Rs. 11,000 each year for the period of 10 years. The annual interest rate is 9%. [6]

OR

- Q6)** a) Write a short note on Time Value Money. [4]
b) Calculate the internal rate of return for CNC machine that will cost Rs. 4,00,000/- will last 10 years, and will result in savings of labor cost of Rs. 90,000/- each year. [6]

P.T.O.

- Q7)** a) An installed capacity of the plant is 210 MW and its capital cost is Rs 10,000/- per kW. The fixed cost is 13% of the investment cost. At full load, the variable cost is 1.3 times the fixed cost per year. Assuming the variable cost is proportional to the energy produced, find the generating cost of when the plant is running at full load and 50% load. [8]
 b) What is steam distribution system? Explain with neat sketch. [6]

OR

- Q8)** a) Write down the energy conservation opportunities in DG set and air compressor system. [6]
 b) The boiler of the capacity 30 MW power plant has an overall efficiency of 25% the CV of Fuel used is 25000 kJ/kg. Estimate the cost of coal used per day (24 hrs) if the load factor of the plant is 0.4 one ton of coal costs Rs 650/- [8]

- Q9)** a) Write the provisions made in Electricity act 2003 for illumination levels. [6]
 b) The connected load for hospital is as below
 i) 80 Fluorescent tubes of 40 W each
 ii) 60 Incandescent bulb of capacity 60 W each
 iii) 12 old fan of 100 W each
 It is decided to replace all tubes, bulbs by 20 W LED bulbs and old fans by new fans of 80 W. Considering usage of 10 hrs per day and electrical tariff of Rs. 3.5 per kWh. Calculate energy saving of tubes and fans replacement of one year. [7]

OR

- Q10)** a) Write the parameters considered in performance analysis of energy efficient lighting system. [7]
 b) Give in details the selection criteria for electric motor in industrial application. Also discuss the energy saving opportunities in electric motor. [6]

- Q11)** a) What is pinch analysis? With the help of example explain it. [6]
 b) With the help of neat sketch explain the cogeneration plant in sugar industry. [7]

OR

- Q12)** a) What is the need of cogeneration? Explain cogeneration in detail with suitable example. [7]
 b) How to identify the potential of WHR in the Industry, elaborate with suitable example. [6]



Total No. of Questions : 10]

SEAT No. :

P4365

[Total No. of Pages : 4

[5461] - 530

B.E. (Mechanical)

**REFRIGERATION AND AIR CONDITIONING
(2015 Pattern)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.
- 2) Draw Neat diagrams wherever necessary.
- 3) Use of scientific calculator & steam table are allowed.
- 4) Assume suitable data wherever necessary.
- 5) Figures to the right indicate Full marks.

Q1) a) Prove that $COP = \frac{1}{r^{\left(\frac{y-1}{y}\right)} - 1}$ for Bell Coleman Cycle. [6]

b) 2.5 kW per TR is required to maintain the temperature of -20°C in the refrigerator if the refrigeration cycle works on Carnot cycle. Determine the followings a) COP b) T_H c) Q_H d) COP for heating application. [4]

OR

Q2) a) State desirable Properties of refrigerants. [5]
b) Draw and label LiBr vapour absorption cycle. [5]

Q3) a) The temperature limits of an ammonia refrigerating system are 25 °C and – 10°C. If the gas is dry at the end of compression. Calculate the coefficient of performance of the cycle assuming no under-cooling of the liquid ammonia. Use the following table for properties of ammonia:[8]

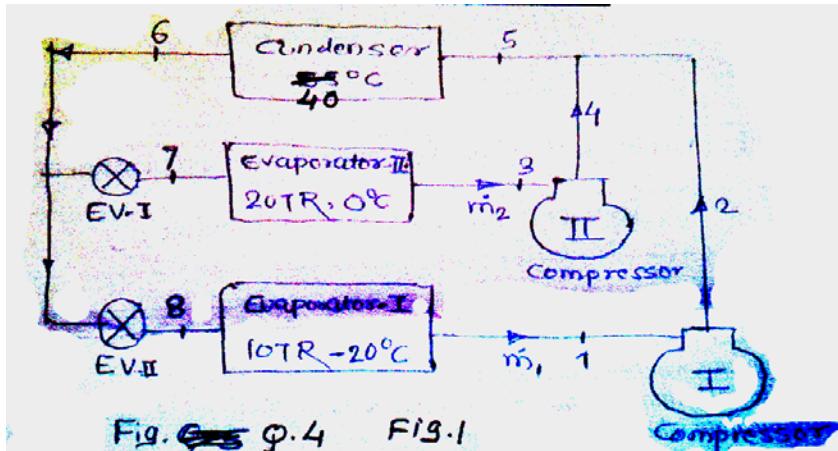
Temperature (°C)	Liquid heat (KJ/kg) (h_f)	Latent heat h_{fg} (KJ/kg)	Liquid entropy (KJ/kg k) (S_f)
25	298.90	1166.94	1.1242
-10°C	135.37	1297.68	0.5443

b) Define the following terms i) SEER ii) IPLV [2]

P.T.O.

OR

- Q4)** A multi evaporator refrigeration system with individual compressors and an individual expansion valves using R-22 as the refrigerant as shown in Fig.1 Neglecting undercooling of liquid and superheating of vapour refrigerant. Find i) Power required to run the system ii) COP [10]



- Q5)** a) Write note on 'Human Comfort Chart'. [6]
 b) Moist air enters a duct at 10°C , 80% relative humidity, and a volumetric flow rate of $150 \text{ m}^3 / \text{min}$. The mixture is heated as it flows through the duct and leaves at 30°C . No moisture is added or removed and the mixture pressure remains approximately constant at 1bar. For steady-state operation. determine [10]
 i) the rate of heat transfer, and
 ii) relative humidity at exit. Use a psychrometric chart for the solution.

OR

- Q6)** a) Derive an expression of Bypass Factor of coil [4]
 b) A mixture of dry air and water vapour is at a temperature of 21°C under a total pressure of 736 mm Hg. The dew point temperature is 15°C . Find. [12]
 i) Partial pressure of water vapour
 ii) Relative humidity
 iii) Humidity ratio
 iv) Enthalpy of air per kg of dry air
 v) Specific volume of dry air per kg of dry air.

- Q7)** a) Explain with neat sketch 'Summer Air Conditioning System' [6]
 b) Explain the working of scroll compressor with a schematic. [6]
 c) Explain working of Capillary tube and list its advantages and disadvantages. [6]

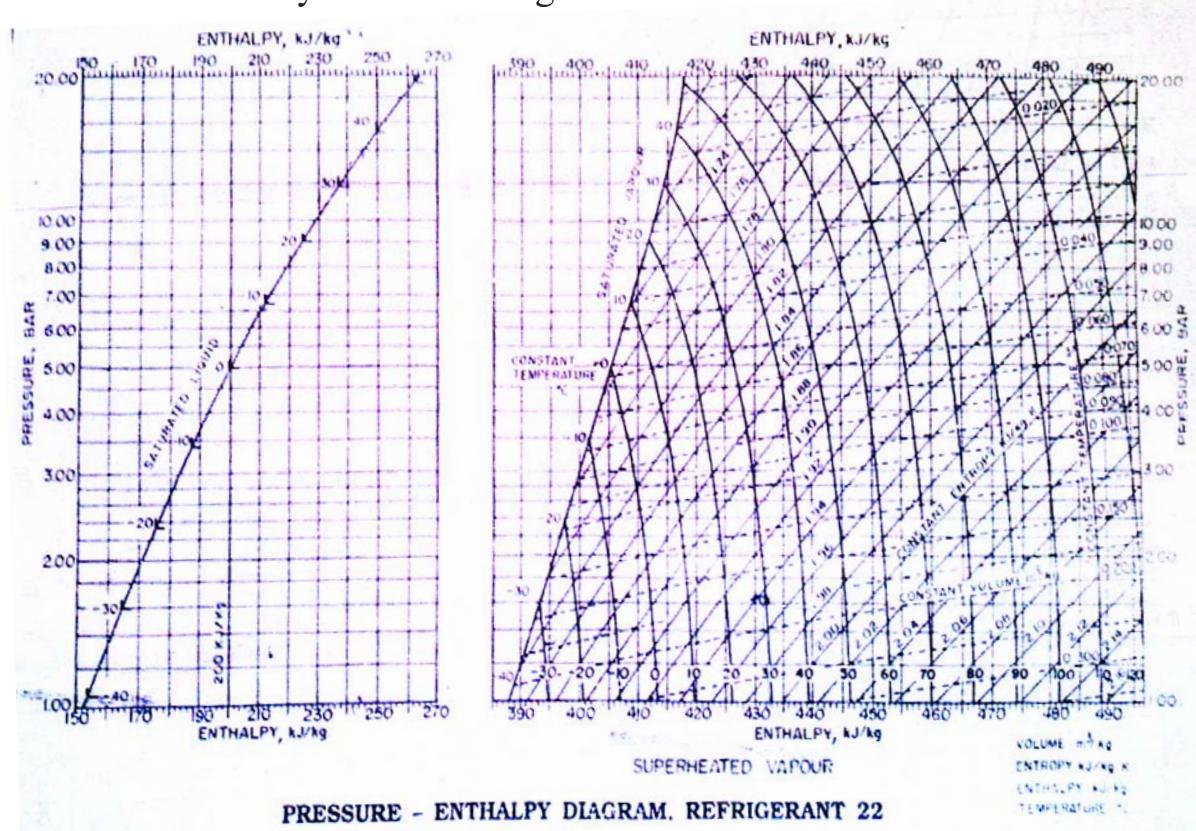
OR

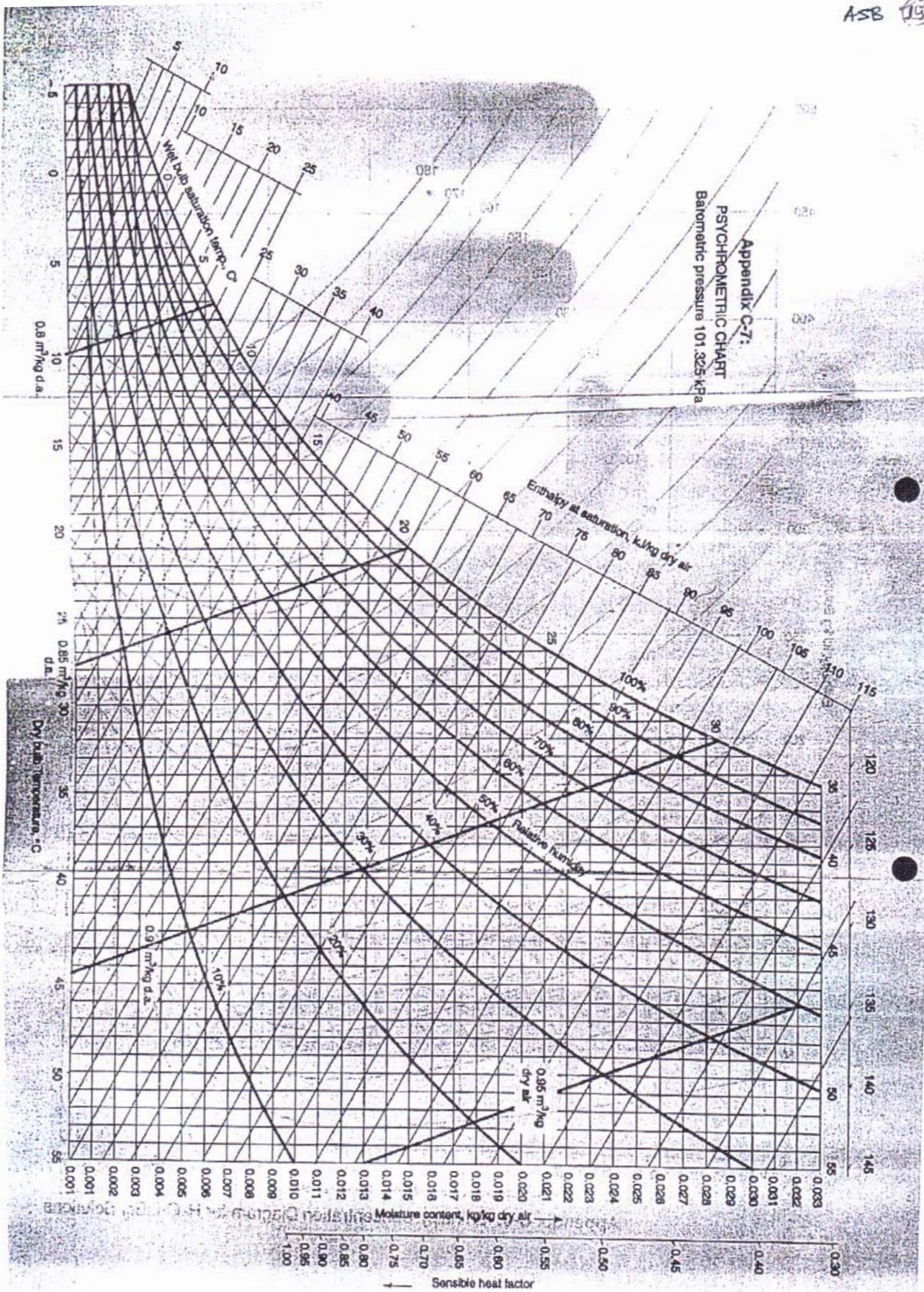
- Q8)** a) Explain with neat sketch '**All Year Air Conditioning System**'. [6]
 b) Discuss the advantages of variable refrigerant flow air conditioning system. [6]
 c) Explain with neat sketch '**Evaporative Condensers**' [6]

- Q9)** a) A rectangular duct of $0.15 \text{ m} \times 0.12 \text{ m}$ is 20 m long and carries standard air at the rate of $0.3 \text{ m}^3/\text{s}$. Calculate the total pressure required at the inlet of the duct in order to maintain this flow and the air power required. Take friction factor, $f = 0.005$ [8]
 b) Explain air flow through simple duct system. [8]

OR

- Q10)** a) Draw an air handling unit and state its components with their function (s) [8]
 b) A circular duct of 40 cm diameter is used to carry air in an air conditioning system at a velocity of 440 m/min. If this duct is to be replaced by a rectangular duct of aspect ratio of 1.5, find out the size of rectangular duct for equal friction method when. [8]
 i) Velocity of air in two ducts is same.
 ii) The discharge rate of air in two ducts is same.
- If $f = 0.015$, find out the pressure loss per 100 m length of the duct. Take the density of air = 1.15 kg/m^3 .





Total No. of Questions : 10]

SEAT No. :

P3718

[Total No. of Pages : 2

[5461]-531

B.E. (Mechanical-Sandwich)

AUTOMOBILE ENGINEERING

(2015 Pattern) (Semester - I) (Self Study - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of electronic pocket Calculator is allowed.
- 5) Assume Suitable data, if necessary.

Q1) a) Draw a vehicle layout for front engine rear wheel drive. Explain components of it. [5]

b) Describe the history of automobile and its development. [5]

OR

Q2) a) Explain the following types of vehicle bodies. Describe their specifications. [5]

- i) Hatchback
- ii) Saloon

b) Describe the cross sections used for framed chassis. Write down the details of chassis material used for it. [5]

Q3) a) Explain construction of wheel. What are benefits to use alloy wheels, Explain. [5]

b) Explain the construction and working of Multi plate clutch used in automobile. [5]

OR

Q4) a) Describe the necessity of gearbox in automobile. [5]

b) Explain with neat sketch construction of propeller shaft and its end joints. [5]

P.T.O.

Q5) a) Describe with neat sketch steering mechanism used in automobile. Write the equation for correct steering. [8]

b) What are the objectives of Suspension systems? Explain advantages and disadvantages of independent suspension over dependent suspension system. [8]

OR

Q6) Write short note on the following (Any two) : [16]

- a) Air brake system.
- b) Construction of Leaf spring.
- c) Shock absorber.

Q7) a) Explain the role of Safety systems in automobiles. [8]

b) Explain the construction and working of electric horn used in modern automobile. [8]

OR

Q8) a) What is Active safety and Passive safety? List the various components employed for it. [8]

b) Draw an automobile seat and explain various parts of it. What is the role of head restraint? Explain. [8]

Q9) a) What are various test tracks used to check performance of automobile? Explain them in brief. [9]

b) Describe with neat sketch following Road Safety signs as per CMVR. [9]
i) Oneway.
ii) U-Turn Prohibited.
iii) Speed limit40.
iv) Horn Prohibited.

OR

Q10) Write short note on the following (any three) : [18]

- a) Multi Axle Vehicle
- b) Construction of Head Lamp
- c) Different types of Bulldozers
- d) Crash test of vehicles.



Total No. of Questions : 10]

SEAT No. :

P3719

[Total No. of Pages : 2

[5461]-532

B.E. (Mechanical-Sandwich)

**PLANT ENGINEERING AND MAINTENANCE
(2015 Pattern)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Explain assessment of maintenance work in context with plant engineering. [6]

b) What is product quantity analysis? Explain with suitable example. [4]

OR

Q2) a) What are different basic plant facilities? [6]

b) Explain Muther's plant layout procedure with neat diagram. [4]

Q3) a) What is REL chart? Explain. [4]

b) What is maintainability? What are different factors affecting maintainability? [6]

OR

Q4) a) Explain any one layout optimization technique. [4]

b) Discuss classification of material based on MICLASS and CUSDD in brief. [6]

Q5) a) What is preventive maintenance? Explain importance of preventive maintenance. [8]

b) What is Life Cycle Cost (LCC)? What are different parameters to be considered during calculating LCC? [8]

P.T.O.

OR

- Q6)** a) Explain mathematical formulation for calculating Life Cycle Cost. [8]
b) Differentiate between Time-based preventive maintenance & predictive maintenance. [8]

- Q7)** a) What are fundamental sources of failures explain in brief? [8]
b) Explain FMEA in detail. [8]

OR

- Q8)** a) Explain need of failure analysis? What are different tools for failure analysis? [8]
b) Discuss-safety against mechanical hazards. [8]

- Q9)** a) What is condition based monitoring? What are different tools for condition based monitoring? Explain any one. [10]
b) What is Total Productive Maintenance? State merits and demerits of Total Productive Maintenance. [8]

OR

- Q10)** Write short note on any three : [18]
a) Reliability Centered Maintenance (RCM).
b) Overall Effectiveness of Equipment (OEE).
c) Condition based maintenance using SOAP.
d) Design for maintainability.



Total No. of Questions : 10]

SEAT No. :

P3297

[Total No. of Pages : 2

[5461]-541

B.E. (Automobile Engineering)

**AUTOMOTIVE REFRIGERATION AND AIR CONDITIONING
(2015 Pattern) (416488) (Semester - I) (End Sem.) (Paper - I)**

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) All questions are compulsory.
- 2) Use of logarithmic tables slide rule, Mollier charts, electronic pocket, Psychrometric chart calculator and steam tables is allowed.
- 3) Assume suitable data if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

Q1) a) Explain with neat diagram Vapour Absorption System. [6]
b) Draw the P-V and T-S diagram for Carnot cycle, [4]

OR

Q2) a) What are the different Properties of Refrigerant? [6]
b) Explain in brief Future Refrigerant. [4]

Q3) a) What are the different components of Air conditioning system explain it in brief. [6]
b) Write note on i) Accumulators and ii) Driers. [4]

OR

Q4) a) Explain different types of Temperature control systems in brief.
(Any two) [6]
b) Draw the diagram for air distribution mode such as Face, Foot, Deforest, and demist. [4]

Q5) a) Explain Psychometric Properties in Brief. [4]
b) Determine final DBT and RH of air washed with recirculated spray water if the air is initially at DBT 35° C and 50% RH as it enters an Air Washer has humidifying efficiency of 85% . Show the process on diagram. [12]

OR

Q6) a) Explain the terms i) ADP, ii) Coil condition line iii) Sensible heat factor, iv) Bypass factor. [8]
b) Explain the Process of Humidification and Dehumidification. [8]

P.T.O.

- Q7)** a) Explain various factors forming load on Air conditioning system. [6]
b) Explain Temperature Sensors used in A/C systems. [6]
c) Explain A/C system electrical and Electronic control system. [6]

OR

- Q8)** a) The following data relates to the Automotive Bus A/C having seating capacity of 25 occupants. Assume 40% Fresh Air 60% Recirculated Air passing through evaporator coil and Bypass factor is 0.15. find DPT of coil and capacity of system. [18]

Outside Design Condition : 34° C DBT 28°C WBT

Inside Design Condition : 24° C DBT 50% RH

Solar Heat Gain : 9120 W

Latent Heat Gain Per Occupant: 105W

Sensible Heat Gain per Occupant: 90W

Lightning Load:2300 W

Sensible Heat Load From Other Sources : 11360W

Infiltration Load : 14m³/min

- Q9)** a) Explain methods of Leak Detection in A/C system. [8]
b) How the temperature and Pressure measurement is done in A/C systems. [8]

OR

- Q10)**a) Explain following processes refrigerant recovery; recycle and charging, system oil, system flushing. [8]
b) Explain in brief Initial vehicle Inspection Procedure. [8]



Total No. of Questions : 10]

SEAT No. :

P3298

[Total No. of Pages : 2

[5461] - 542

B.E. (Automobile Engineering)

**ALTERNATIVE FUELS AND EMISSION CONTROL
(2015 Course) (Semester - I) (416489)**

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, and Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Describe the desirable properties of fuels in IC engine. [5]

b) Explain the various factors affecting on combustion technology of IC engine. [5]

OR

Q2) a) Summarize the negative effects of NOx and CO pollutants on human being. [5]

b) What are the modifications required to use Biodiesel as alternative fuel for CI Engine. [5]

Q3) a) Compare the properties of hydrogen and CNG as an alternative fuel for IC engine. [5]

b) Explain the electrolysis production method of hydrogen fuel with neat sketch. [5]

OR

Q4) a) Define wall quenching and explain the effects of wall quenching on SI engine emission. [5]

b) Explain the types and causes of smoke formation in diesel engine. [5]

P.T.O.

- Q5)** a) Explain with neat sketch constructional and operational features of flame ionization detector (FID) for measurement of HC concentration. [8]
b) Describe the Bharat stage emission standard norms for diesel heavy duty vehicles. [8]

OR

- Q6)** a) Draw and explain the urban (ECE) and extra urban European (EUDC) driving test cycle for vehicles. [8]
b) Why Vehicle emission standard (VES) is necessary? Discuss the various objectives of VES. [8]

- Q7)** a) Justify your answer, how to assist variable swept volume technology in emission control with its advantages. [8]
b) Explain in detail how it affects engine design parameters on SI engine emission control. [8]

OR

- Q8)** a) Explain with neat sketch construction and working of positive crankcase ventilation (PCV) system. [8]
b) What are the requirements of Catalyst Substrate? Explain the characteristics of ceramic monoliths catalyst. [8]

- Q9)** a) Explain the various factors affecting on performance of three way catalytic convertor (TWC). [6]
b) Suggest the various hydrocarbon emission reduction techniques in IC engine. [6]
c) Discuss the advantages and disadvantages of Electronic Fuel Injection (EFI) System. [6]

OR

- Q10)** a) Write the functions and explain construction of wash coat in catalytic converter. [6]
a) Discuss in detail role of diesel particulate filter (DPF) in emission control of CI engine. [6]
b) Explain the performance characteristics and advantages of CRDI system. [6]



Total No. of Questions : 10]

SEAT No. :

P3299

[Total No. of Pages : 3

[5461]-543

**B.E. (Automobile Engineering)
Machine and Vehicle Dynamics
(2015 Course) (Semester-I)**

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Use of Logarithmic tables, slide rule, electronic pocket calculator is allowed.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) Explain with displacement time plot, the over damped, under damped vibratory systems? [6]
b) Write in brief about generalize equation of motion. [4]

OR

- Q2)** a) Explain direct reverse crank method in brief? [6]
b) Explain frequency response curve in brief. [4]

- Q3)** a) Machine of mass 5kg supplied with spring of total stiffness 1200 N/m undergoes harmonic excitation force of 30 N. The damping is considered to be viscous and is having damping coefficient of 90 N sec/m. Determine [10]
i) Resonance Frequency
ii) Phase angle at resonance
iii) Amplitude at resonance
iv) Damped Frequency
v) Frequency corresponding to peak amplitude

OR

- Q4)** An air compressor has four inline cylinders at 90 degree intervals. The crank radius is 140 mm, connecting rod is 560 mm long for each cylinder. Mass of reciprocating part is 20 kg for each cylinder and speed of rotation is 600 rpm the cylinders are 300 mm apart, Firing order is 1-2-3-4 find out balancing forces and couple required. [10]

P.T.O.

- Q5)** a) Write in brief about Various external forces acting on vehicle. [8]
 b) What is Draw Bar pull and explain its relation with Engine power. [8]

OR

- Q6)** a) With axle load diagram explain wheel load at, [8]
 i) Level ground
 ii) Low Speed acceleration
 iii) On gradient
 b) What is the impact on vehicle performance if flywheel is made up of heavy or light weight material. [8]

- Q7)** a) Following information is given about car, [12]
 Engine Inertia: 0.8

RPM	Torque	RPM	Torque	RPM	Torque
800	120	2400	175	4000	200
1200	132	2800	181	4400	201
1600	145	3200	190	4800	198
2000	160	3600	198	5200	180

Transmission Data:

Gear	1	2	3	4	5
Inertia	1.5	0.95	0.75	0.6	0.4
ratio	4.4	3.1	2.2	1.5	1
Efficiency	0.966	0.96	0.972	0.975	0.9

Final Drive : Inertia :1.3 Ratio:2.5 efficiency:0.99

Wheel Inertia: Drive:15 Driven:15 radius:20 inch

Find out effective inertia and tractive effort at each gear (maximum)

- b) Derive the expression for stopping distance and time. [6]

OR

- Q8)** a) Derive generalize expression for “Power limited acceleration” which gives relation between engine power and tractive effort. [9]
- b) Consider a truck with weight 2500 kg, braking from 120 km/hr speed on level surface which develops braking force of 1200 N. Find out, [9]
- Deceleration
 - Stopping distance
 - Time for stopping
 - Power absorbed during braking

Q9) Write a brief note on

- Neutral steer, under steer, and over steer. [4]
- Constant radius method for under steer gradient measurement. [4]
- Mathematical model of handling. [4]
- Effects of damping the vibration. [4]

OR

Q10) Write a brief note on

- Explain yaw velocity response / gain [4]
- Constant speed method for under steer gradient measurement. [4]
- Excitation sources for vehicle ride. [4]
- Active and semi active suspension. [4]



Total No. of Questions : 10]

SEAT No. :

P3720

[Total No. of Pages : 2

[5461]-545

B.E. (Automobile Engineering)
FUNDAMENTALS OF COMPUTATIONAL FLUID
DYNAMICS (Elective - I)
(2015 Pattern) (Semester - I)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, & Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Explain the Physical interpretation of governing equations. [6]
b) State and explain applications of CFD. [4]

OR

- Q2)** a) Write short note on Crank Nicholson's Method. [6]
b) Enlist the Steps in CFD solution procedure. [4]

- Q3)** a) Write short note on grid generation in CFD. [6]
b) What is Stability Criteria concept? [4]

OR

- Q4)** Explain implicit approach for irregular boundary for 2D heat conduction problems with suitable example. [10]

- Q5)** a) Explain solution of first order wave equation by Mac cormack method. [10]
b) Write short note on Peclet Number. [6]

P.T.O.

OR

- Q6)** a) Explain the 2D steady Convection Diffusion system by Central difference approach. [8]
b) Explain solution of first order wave equation by Lax Wendroff scheme. [8]

- Q7)** a) Explain the steps involved in SIMPLER algorithm with advantages. [10]
b) What are the Application to flow through pipe? [6]

OR

- Q8)** a) Explain Finite Volume Method. [6]
b) Derive the Navier-Stoke's equation for incompressible flow. [10]

- Q9)** a) Explain turbulence models in details. [8]
b) Explain in detail Physical Boundary condition types. [10]

OR

- Q10)** a) Explain the selection of physics and fluid properties in detail. [8]
b) Explain $k-\epsilon$ and $K-\omega$ model in detail. [10]



Total No. of Questions : 8]

SEAT No. :

P3300

[5461]-546

[Total No. of Pages : 4

B.E. (Automobile)

**FUNDAMENTALS OF FINITE ELEMENT ANALYSIS
(2015 Pattern) (End Sem.) (Elective - I) (Semester - I) (416491B)**

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Logarithmic tables, slide rule, electronic pocket calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Explain the ‘Weighted residual approach’ in finite element analysis. [6]

b) For truss shown in figure (1), determine the nodal displacement. The force acting on node 2 in X direction is 10 kN and Y direction is 5 kN. Take modulus of elasticity $E = 200 \text{ GPa}$ and area of cross section of each element is 200 mm^2 . [8]

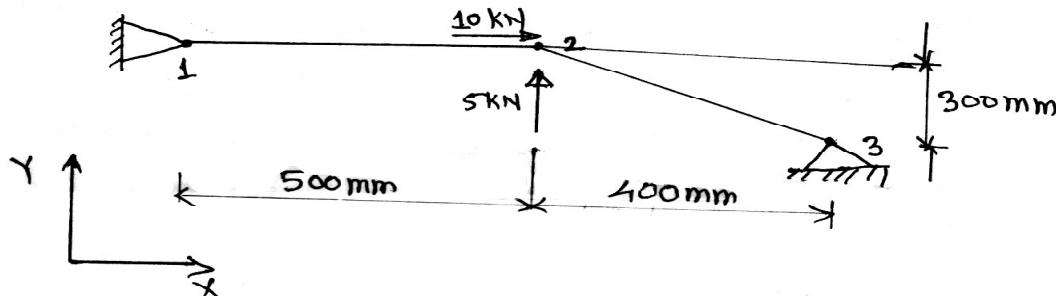


Figure No. 1.

c) Write the short note on [6]

- i) Constant strain triangle
- ii) Linear strain rectangle

OR

Q2) a) Write and explain the ‘Principle total potential energy approach’ in finite element analysis. [6]

P.T.O.

- b) Find the displacement of all elements of stepped bar shown in figure (2). Take modulus of elasticity $E = 200$ GPa. [8]

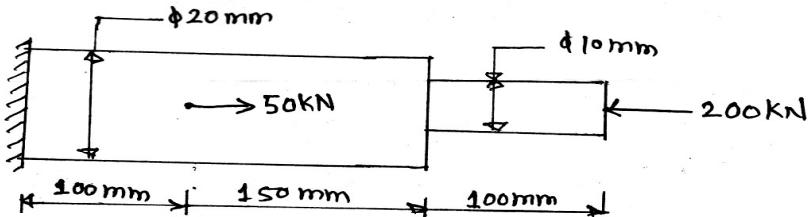


Figure No. 2

- c) Write the short note on [6]
- Pascal's Triangle
 - Axi-symmetrical Element

Q3) a) Explain the following terms [8]

- Iso-parametric elements
- Sub parametric elements
- Super parametric elements
- Sub modelling

b) Evaluate the integrals using three points Gaussian quadrature method [10]

$$\text{i) } \int_{-1}^1 (e^x + x^3 + x^2) dx$$

$$\text{ii) } \int_{-1}^1 (3^x - x) dx$$

OR

Q4) a) Derive the shape function of 3 node bar element using iso-parametric formulation. [8]

b) The iso-parametric shape function of CST element shown in figure(3) are given $N_1 = \xi$, $N_2 = \eta$, $N_3 = 1 - \xi - \eta$. Evaluate the shape function interior point P. The displacement of nodes 1,2,3 are 2.5mm, 3mm, 5mm respectively. Evaluate the displacement of point P. [10]

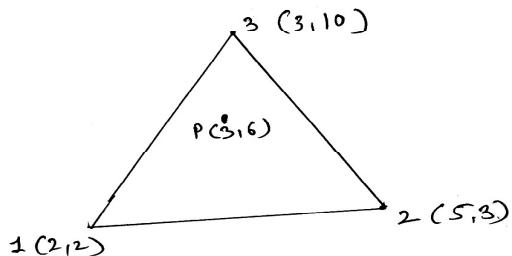


Figure No. 3.

- Q5)** a) Formulate the 1D steady state conduction heat transfer equation using the Galerkin approach. [8]
- b) A composite wall consisting of two material shown in figure (4). The outer temperature is $T_0 = 20^\circ\text{C}$, convection heat transfer takes place on inner wall $T_\infty = 800^\circ\text{C}$ and $h = 25\text{W/m}^2 \text{ }^\circ\text{C}$. Determine the temperature distribution in wall. [8]

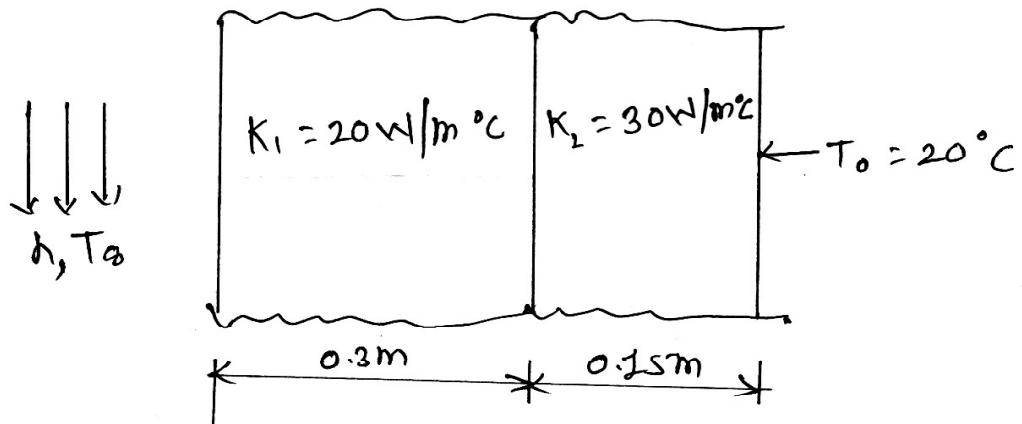


Figure No. 4

OR

- Q6)** For the one dimensional road shown in figure(5). Is insulated except the ends, determine the temperature at $L/3$, $2L/3$ and L . Let's thermal conductivity of rad $K = 60 \text{ W/m } ^\circ\text{C}$ and right end having the $h = 800 \text{ W/m}^2 \text{ }^\circ\text{C}$ and $T_\infty = 0^\circ\text{C}$ and the temperature at left end is 95°C . [16]

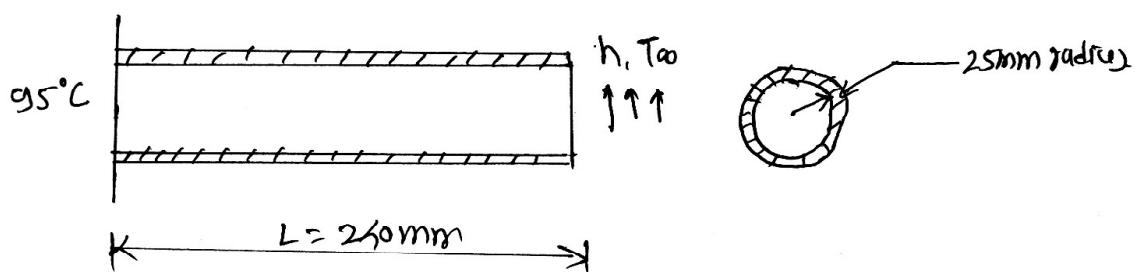


Figure No. 5

- Q7)** a) Formulate the consistent matrices for 1D bar element. [8]
b) Find the natural frequency of bar shown in figure(6), using consistent and lumped mass matrix method. Use one element for bar. Take modules elasticity of $E = 200 \text{ GPa}$, density of material $\rho = 7800 \text{ kg/m}^3$ and length of rod $L = 2\text{m}$ [8]

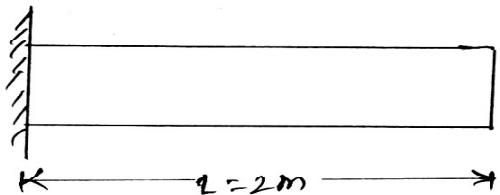


Figure No. 6

OR

- Q8)** a) Explain the difference between lumped mass matrix and consistent mass matrix. [8]
b) Write the notes on error analysis. [8]



Total No. of Questions : 10]

SEAT No. :

P3721

[Total No. of Pages : 3

[5461]-547

**B.E. (Automobile Engineering)
CAE AND AUTOMATION (Elective - I)
(2015 Pattern)**

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator is allowed.*
- 4) *Assume suitable data if necessary.*
- 5) *Q9 is compulsory.*

Q1) a) Define the terms Geometry and Topology. [4]

b) Enlist the types of Curves. Explain any two analytical curves in detail. [6]

OR

Q2) a) Explain Boolean operation for Constructive Solid Geometry (CSG) with suitable sketch. [6]

b) A triangle ABC with vertices A(0, 0), B (4,0) & C (2,3) is to be rotated by 90 CCW about a point A. Find the updated coordinates of the triangle ABC. [4]

Q3) a) Write down the inverse transformation matrices for i) Translation ii) Rotation iii) Scaling iv) Reflection. [4]

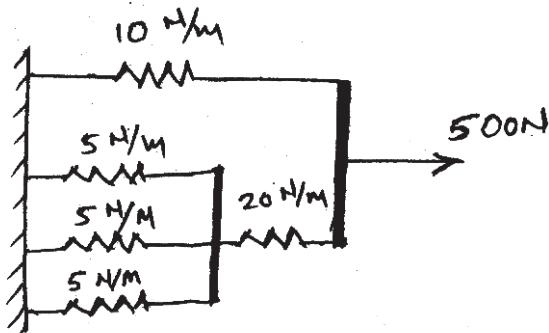
b) Write short note on transformation matrices used in orthographic projections. [6]

OR

P.T.O.

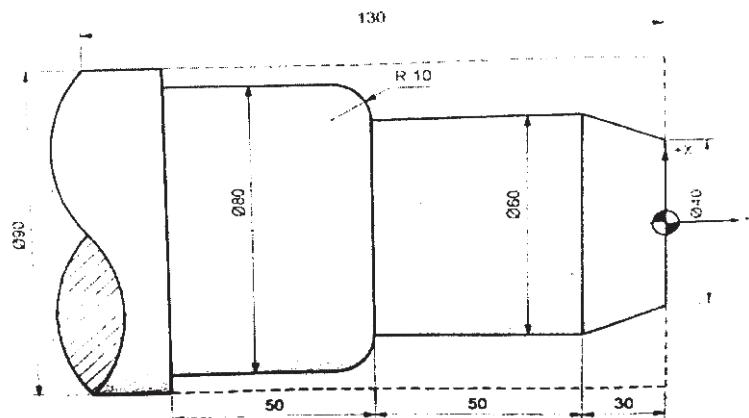
Q4) a) Write short note on Boundary conditions. [4]

b) The system of springs, is shown in figure below. Find the Deflection of each spring. [6]



Q5) a) Explain the steps involved in integrating CAD, NC and CAM. [6]

b) Develop the part program using G and M codes for MS job of size Dia. 90×130 mm length as shown in figure. Assume suitable cutting parameters and various canned cycles to turn the final shape from raw material. [12]



OR

Q6) Write short note on (Any Three) : [18]

- a) Advantages, Limitation and Application of CNC machine tools.
- b) Direct Numerical Control.
- c) Adaptive Control System.
- d) Rapid Prototyping.

Q7) a) What is automation? Compare the types of automation. [8]

b) Explain the methods of grouping the parts in to part families in group technology. [8]

OR

Q8) a) Describe the various layouts of FMS with neat sketch. [8]

b) What is AGV? State the types of AGV with neat sketch. [8]

Q9) a) Explain any two industrial application of robots with neat sketch. [8]

b) Explain types of robots Joints with suitable sketches. [8]

OR

Q10) a) State and explain the parameters used in robot specifications. [8]

b) What are the types of end effectors? Explain any one in details. [8]



Total No. of Questions : 10]

SEAT No. :

P3301

[Total No. of Pages : 2

[5461]-548

B.E. (Automobile Engineering)
SPECIAL PURPOSE VEHICLE

(2015 Pattern) (Semester - I) (Endsem.) (Elective - II) (416492A)

Time : 2 ½ Hours]

[Max. Marks : 70]

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and or Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

- Q1)** a) What is an off road vehicle? State the applications and construction layout of an off Road vehicle. [8]
b) Explain the construction and working of power plant used in road construction. [8]

OR

- Q2)** a) Differentiae between crawler mounted tractor and wheel mounted tractor. [6]
b) Explain the construction and working of dipper shovel. [10]

- Q3)** Explain the constructional layout of Dragline. [4]

OR

- Q4)** Explain the constructional layout of scraper. [4]

- Q5)** a) Explain the construction and working of Grader with neat sketch. [10]
b) Compare transmission drive P.T.O. and Independent drive P.T.O. [8]

OR

- Q6)** Write a short note on [18]
a) Gun Carries
b) Transport Vehicles
c) Pulverizes & Rollers

- Q7)** a) Explain about power steering system of the vehicle. [8]
b) Explain OCDB and dry disc caliper brake system of the vehicle. [8]

OR

P.T.O.

- Q8)** a) Write a short note on agricultural implements with neat sketches. [8]
b) Explain the design aspects of Loader bucket. [8]

- Q9)** a) What are the factors affecting traction performance? Explain. [8]
b) Write down the types of soil and list the different properties. [8]

OR

- Q10)** Write a short note on [16]

- a) Soil-Vehicle Mechanics
- b) Mobility Index (MI)
- c) Vehicle Cone Index (VCI)
- d) Rated Cone Index (RCI)



Total No. of Questions : 10]

SEAT No. :

P3302

[Total No. of Pages : 2

[5461]-549

B.E. (Automobile Engineering)
VEHICLE MAINTENANCE (416492B)
(2015 Pattern) (Semester - I) (Elective - II)

Time : 2 ½ Hours]

[Max. Marks : 70]

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and or Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain in brief the difference between overhauling and re-conditioning. [5]
b) Prepare a list of weekly maintenance should be carried out for a four wheeler vehicle. [5]

OR

- Q2)** a) Briefly explain overhauling of cooling system of a car. [5]
b) Explain tuning of carburettor for optimum fuel supply. [5]

- Q3)** a) What is the procedure for testing of connecting rod for bend and twist? [5]
b) What is circlip? How it can be removed and fixed? [5]

OR

- Q4)** a) Illustrate a typical maintenance log sheet of an automobile. [5]
b) Explain in detail work to be carried out for Engine tune-up and top overhauling. [5]

- Q5)** a) Define the following terms with neat diagram. [8]
i) Camber
ii) Caster
iii) King Pin Inclination
iv) Toe in & Toe out
b) What is meant by clutch pedal free play? What are the effects of incorrect adjustment of it? [8]

OR

P.T.O.

- Q6)** a) Explain in detail the different problems occurs in gear box and give the at least two causes for each problems. [8]
b) Explain the hydraulic steering system with neat sketch & prepare a list of causes & remedies for it. [8]

- Q7)** a) Explain the Air braking system with neat diagram & prepare a list of causes & remedies related to each component. [8]
b) What is meant by bleeding of hydraulic brakes? Explain with neat sketch how it is done? [8]

OR

- Q8)** a) Explain the independent suspension system of vehicle & enlist the various causes affecting on performance of it. [8]
b) Discuss the different methods for two wheeler brake adjustment in detail. [8]

- Q9)** a) Explain in detail the different type of sensors used in diagnostic system and give its location in the vehicle. [9]
b) Discuss the reliability related to the vehicle Maintenance in detail. [9]

OR

- Q10)**a) Analyze the role of electronic control module in automotive diagnosis system. [9]
b) Discuss the role of maintainability related to the vehicle Maintenance in detail. [9]



Total No. of Questions : 10]

SEAT No. :

P3303

[Total No. of Pages : 2]

[5461] - 550

B.E. (Automobile)

PRODUCT DESIGN AND DEVELOPMENT

(2015 Pattern) (416492 C) (Semester-I)

Time : 2 ½ Hours

[Max. Marks : 70]

Instructions to the candidates:

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

Q1) How standardization, simplification & specialization are related to product design. [10]

OR

Q2) a) List modern approaches to product design explain any one. [6]
b) Discuss briefly the concept of market Segmentation. [4]

Q3) Discuss mission statement and technical questioning in context of product design. [10]

OR

Q4) What is a concept selection? Explain Pugh's chart with example. [10]

Q5) a) Explain the procedure for product teardown in details. Discuss force flow diagram with suitable example. [10]
b) Explain any two product Architectures. [8]

OR

Q6) Explain the procedure for setting product specification. Describe specification sheet for suitable example with functional requirement & Constraints. [18]

Q7) Explain the guidelines for 'Design for manufacture', 'Design for Assembly' & 'Design for Environment'. [16]

OR

P.T.O.

Q8) a) What are guidliner for ‘Design for safety’? Discuss in detail. [8]

b) What is the ‘Life Cycle Assesment’. [8]

Q9) a) Elaborate the concept of ‘product Life cycle Management’. Explain the role of people, tools, processes, methods & data in PLM. [8]

b) i) What are the roles of PLM. [4]
ii) What are benifits of PLM. [4]

OR

Q10) Explain product data management with reference to

a) Components.
b) Benifits &
c) Features. [16]

@@@ @

Total No. of Questions : 8]

SEAT No. :

P3669

[Total No. of Pages : 2

[5461]-551
B.E. (Electronics)
VLSI Design
(2015 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) What are the different types of FSMs of VHDL, describe in detail with neat diagram? [8]
- b) Derive the expression for voltage threshold (V_{th}) of CMOS. [6]
- c) Describe in detail 2 schemantics of DRAM (1T and 3T) and explain its operation. [6]

OR

- Q2)** a) Draw Logic Symbol, state table, state diagram of a single way traffic light controller and write a VHDL code for the same Using FSM. [8]
- b) Explain with neat diagram, bitline conditioning, column circuitry and address decoders. [6]
- c) Describe Combinational MOS Logic Circuits : Pass Transistors/ Transmission Gates by using 2:1 MUX. [6]

- Q3)** a) What is clock skew and clock jitter? Explain Clock distribution and optimization techniques. [8]
- b) What are the challenges of floor planning? Explain interconnect routing techniques. [8]

OR

P.T.O.

Q4) a) Explain in detail architecture of I/O and Pad design. [8]

b) What is wire parasite? List down signal integrity issues. [8]

Q5) a) Write a Verilog code for a 4×4 bit multiplier. Draw neat sketch of multiplication method. [8]

b) What is a logic block in FPGA? Explain 4bit LUT in FPGA with an example. [9]

OR

Q6) a) What do you mean by Shannons decomposition? Implement logic gates like AND, XOR and NOT using 2:1 MUX. [9]

b) Explain fast carry chains and cascade chains in FPGA with neat sketch. [8]

Q7) a) What are the design rules available in Layout Design? Explain design rules for NMOS. [8]

b) What is Test Access Port? Draw state machine diagram of TAP. [5]

c) List down different layout editors/ tools available in VLSI Design. [4]

OR

Q8) a) What is need of Boundary Scan. Explain Boundary Scan technique in detail. [6]

b) What is Design Rule Check (DRC)? Explain parasitic extraction in Physical Layout design. [6]

c) Draw Stick Rule Diagram for a CMOS Inverter. [5]



Total No. of Questions : 8]

SEAT No. :

P3722

[Total No. of Pages : 2

[5461]-552

B.E. (Electronics)

ADVANCED POWER ELECTRONICS
(2015 Pattern) (Semester - I) (End Semester)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

Q1) a) With the help of block diagram explain any two control schemes for non-circulating current type dual converter. [8]

b) The speed of separately excited motor is controlled by a single phase semiconverter. The field current is also controlled by semiconverter, is set to maximum possible value. The ac supply voltage to the armature & field converters is one phase, 208V, 60Hz. The armature resistance is $R_a = 0.25\Omega$, the field resistance is $R_f = 120\Omega$, & the motor voltage constant is $Kv = 0.7032 \text{ V/A rad/s}$. The load torque is $T_L = 45 \text{ Nm}$ at 1200 rpm. The viscous friction constant & no load losses are negligible. The inductances of the armature & field circuits are sufficient enough to make the armature & field current continuous & ripple free.

Determine :

[4]

- i) The field current I_f
 - ii) The delay angle of the converter in the armature circuit, α_a .
- c) Discuss flying capacitor Multilevel Inverter with circuit diagram and waveform. [8]

OR.

Q2) a) What is Power factor? Explain extinction angle control method of Power factor improvement technique with circuit diagram and waveform. [8]

b) Discuss step up cycloconverter for $f_o = 3 f_i$ with circuit diagram & waveform. [6]

P.T.O.

- c) Explain Torque, Armature current & field current versus speed characteristics for separately excited DC Motor. State instantaneous armature current equation. [6]

- Q3)** a) Draw torque speed characteristics of Induction Motor & explain its operating mode with parameter ‘slip’. [8]
b) Explain variable frequency SPWM VSI drive with circuit diag. & waveform. [8]

OR

- Q4)** a) Discuss operation of Direct vector control method of Induction motor. [8]
b) State and explain any four performance parameters of a three phase induction motor. [8]

- Q5)** a) With the help of neat circuit diagram explain the operation of three phase brushless DC Motor drive. [8]
b) Explain Variable reluctance stepper motor drive with circuit diagram and Torque versus displacement angle characteristics. [8]

OR

- Q6)** a) State the types of D.C. servomotor & explain any one in detail with circuit diagram. [8]
b) Explain the operation of switch reluctance motor drive. [8]

- Q7)** a) With neat diagram explain Grid connected wind energy system. [8]
b) Discuss types of wind generator control of Wind turbines.. [10]

OR

- Q8)** a) State types of Solar power system. Explain any one in detail. [8]
b) Explain selection criteria for solar panel, Inverter, Battery & charge controller in solar power system. [10]



Total No. of Questions : 8]

SEAT No. :

P3304

[Total No. of Pages : 2

[5461]-553

B.E. (Electronics Engineering)
ELECTRONICS SYSTEM DESIGN
(2015 Pattern) (Semester-I) (404203) (End Sem.)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, and Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Assume Suitable data if necessary.

- Q1)** a) Explain different soldering techniques used in large scale production & high reliability product. [4]
- b) Explain the need of Instrumentation Amplifier in analog signal conditioning. Explain different errors occurring in instrumentation amplifier. [8]
- c) Explain microcontroller based data acquisition system. [8]

OR

- Q2)** a) with the help of neat block diagram explain different stages of electronic product design. [4]
- b) Explain different performance factors of DAC. [8]
- c) Explain CAN and LIN protocols with their applications. [8]

- Q3)** a) Explain the different stages of software development in electronics product. [8]
- b) Explain different factors affecting the choice between Assembly language and high level language. [8]

OR

- Q4)** a) What is documentation? Explain categories of software documentation. [8]
- b) Write short note on. [8]
- | | |
|----------------|---------------|
| i) Compiler | ii) Emulator |
| iii) Simulator | iv) Assembler |

P.T.O.

- Q5)** a) What are the different PCB Design issues of analog and mixed signal Circuits. Explain in detail. [8]
b) What is shielding and guarding. Explain the importance of shielding and guarding. [8]

OR

- Q6)** a) What is signal integrity? Justify the significance of SI. How can it be ensure in high speed circuits? [8]
b) List the different EMI\ EMC standards. Explain its importance. [8]

- Q7)** a) Write a short note on
i) Logic Analyzer
ii) Mixed signal oscilloscope [8]
b) What is need of environmental testing? Explain different types of environmental testing. [10]

OR

- Q8)** a) What is sensitivity analysis? Explain sensitivity analysis with example. [8]
b) What are the features & limitations of analog CRO, DSO, Logic analyzer & mixed signal oscilloscope for fault findings? [10]



Total No. of Questions : 8]

SEAT No. :

P3723

[Total No. of Pages : 3

[5461]-554

B.E. (Electronics)

**DIGITAL IMAGE AND VIDEO PROCESSING
(2015 Pattern) (Elective - I)**

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) With the help of block diagram explain various steps in image processing. Also discuss in brief any one application of smart city using image processing. [8]

b) What is the meaning of point operations in image enhancement. Hence explain how power law transformation can be used for gamma correction. [6]

c) Give the formula for 2-D DCT. Explain atleast four properties of DCT and hence discuss how DCT is helpful in compression. [6]

OR.

Q2) a) Consider the image segment shown below. Let $V = \{0, 1\}$ and compute the lengths of the shortest 4, 8 and m paths between 'p' & 'q'. If particular path does not exist between these 2 pixels, explain why? [6]

1	1	2	1	(q)
2	3	0	2	
1	2	1	1	
(p)	1	0	0	5

P.T.O.

- b) What are different LPF and HPF spatial domain masks, write and explain those masks. Why the sum of all filter coefficients in HPF masks comes to be zero? [6]
- c) Explain the following with respect to image compression. [8]
 - i) Entropy and entropy coding methods
 - ii) Redundancy and fidelity criteria

Q3) a) What is morphology with respect to image processing? Explain basic morphology operations dilation and erosion. Hence find out the erosion & dilation of the given image A with the given structuring element B.[10]

$$A = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 0 & 1 & 0 \\ 1 & \boxed{1} & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

- b) What is edge detection? How edge detection algorithm can be used to detect the liquid level content of a transparent bottle. Propose the complete algorithm and state clearly all the assumptions made. [8]

OR

Q4) a) How the image segmentation is possible using thresholding? What is global thresholding? What is its drawback? How adaptive thresholding overcomes this drawback? Give the complete algorithm for adaptive thresholding. [10]

b) Describe edge linking using Hough Transform. Also state the difference between an Edge and a Boundary of an image/object. [8]

Q5) a) Explain the working of pinhole camera model with diagram. [8]

b) How the digital video is formed, represented and perceived, discuss in brief. [8]

OR

Q6) a) Explain CAHV camera model and discuss its use in machine vision. [8]

b) Explain and derive the equation for projective matrix used in camera calibration. [8]

- Q7)** a) What is optical flow? Discuss how it is used to represent 2D motion vector. What is drawback of optical flow. [8]
b) Explain block based motion estimation and compensation technique. What are the advantages and disadvantages of this technique. [8]

OR

- Q8)** a) What is feature? How the features are derived and used for motion estimation. [8]
b) Explain the application of video surveillance in detail. [8]



Total No. of Questions : 8]

SEAT No. :

P3305

[5461]-555

[Total No. of Pages : 2

B.E. (Electronics)

AUDIO & SPEECH PROCESSING

(2015 Pattern) (Semester - I) (Elective - I) (404204B)

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

- Q1)** a) Explain articulatory and acoustic phonetics? What are the different articulators involved in the speech production process? Explain with example any two articulators with their importance in speech production (production of a particular type of sound). [8]
- b) Explain the three bone structure inside the ear to transfer air pressure from outer ear to middle ear. How impedance matching is achieved? [6]
- c) Write the mathematical expression for the computation of short time energy and zero crossing rate? How these values can be used to classify voiced and unvoiced speech segments? [6]

OR

- Q2)** a) Explain the algorithm to compute pitch period using autocorrelation method. How to select the window duration? Compare computation complexity of this method with AMDF method of computation of pitch. [8]
- b) Explain spectrographic representation of speech signal. What is broad band and narrow band spectrogram? What is the standard window size of broad band and narrow band spectrogram? Comment on the time and frequency resolution. [6]
- c) Explain formant estimation based on log spectrum and pitch detection based on harmonic peak detection method. [6]

P.T.O.

Q3) a) How it is possible to reduce data rate using DPCM? Explain in detail. Further, if we use delta modulation for encoding does it helps in reducing the bandwidth requirement (consider quantization noise power)? Discuss in brief. [8]

b) Explain in detail cepstral vocoder. [8]

OR

Q4) a) Explain in detail Adaptive Transform Coder (ATC). [8]

b) Explain filter bank analysis of speech signal and further explain in detail sub-band speech encoding. [8]

Q5) a) With the help of basic speech production model, explain the principle of LPC analysis. How to decide the number of formants? [8]

b) How to use LPC parameter for computation of pitch and formants? [8]

OR

Q6) a) Explain in detail autocorrelation method of computation of LPC parameters. How to decide the number of formants? [8]

b) What is the difference in computation of LPC parameters using autocorrelation and covariance method. Explain covariance method for computation of LPC parameters. [8]

Q7) a) Explain automatic speech recognition system for automatic telephone dialing system (use of statistical method). Explain feature extraction, training and testing phase. [9]

b) Explain in brief Text-to-speech conversion system. Explain phoneme based concatenative speech synthesis. What are the different challenges faced in synthesizing near natural speech. [9]

OR

Q8) a) What is speech enhancement? Explain use of spectral subtraction and comb filter for speech enhancement. Which type of noise is removed using these methods? [9]

b) Explain in brief speaker recognition system. What are the different features used for speaker recognition. Explain in brief. [9]



Total No. of Questions : 10]

SEAT No. :

P3306

[5461]-556

[Total No. of Pages : 2

B.E. (Electronics Engg.)

EMBEDDED SYSTEMS AND RTOS

(2015 Pattern) (Semester - I) (End Sem.) (Elective - I) (404204C)

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) Draw block diagram and explain the architecture of embedded system. Give the classification of embedded system. [6]

b) What is the role of PLL? Explain PLL frequency calculations with reference to F_{in} and F_{cco} . [4]

OR

Q2) a) Explain how priority inversion occurs with example of three task diagram. [6]

b) What do you mean by Sleep mode, Deep Sleep mode, Power-down mode and Deep Power-down mode? [4]

Q3) a) Draw and explain the kernel structure of μ COS II. [6]

b) What is dead lock? How to avoid it? [4]

OR

Q4) a) What is Inter Process Communication? Explain Message Mailbox and Message Queue. [6]

b) Explain the following function related to Semaphore of μ COS II. [4]

i) OSSemPend()

ii) OSSemPost()

Q5) a) Draw and explain block diagram embedded Linux setup. [8]

b) Explain Storage considerations in Embedded Linux. [8]

OR

P.T.O.

- Q6)** a) Draw and explain block diagram of cross development environment used for Embedded Linux. [8]
b) Explain the steps for writing a kernel device driver. Also explain the steps for testing a kernel device driver. [8]

- Q7)** a) Explain various file system used in Embedded Linux. [8]
b) Explain the boot loader challenges in Embedded Linux. [8]

OR

- Q8)** a) What is device driver? What is the use of device drivers in embedded system? Explain different types of device drivers in embedded system. [8]
b) Draw and explain Linux kernel architecture/structure. Explain key features of Linux kernel. [8]

- Q9)** a) Explain Automatic Chocolate Vending Machine with suitable block diagram and state its hardware requirement. [6]
b) What is In-circuit Emulator? With the help of neat diagram explain In-circuit Emulator. [6]
c) Explain porting issues of operating system in an embedded platform. [6]

OR

- Q10)** a) Explain the features of IDE. Explain simple IDE and sophisticated IDE. [6]
b) Draw block diagram and explain development process for embedded system. [6]
c) Explain Testing on Host Machine. Explain Testing Steps at Host Machine. [6]



Total No. of Questions : 10]

SEAT No. :

P3724

[Total No. of Pages : 2

[5461] - 557

**B.E. (Electronics Engineering)
INTERNET OF THINGS
(2015 Pattern)**

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All answers to be written on single answer sheet.
- 2) Assume suitable data wherever necessary.
- 3) Figures to the right indicate marks assigned.

- Q1)** a) Discuss area of development and standardization in internet of things. [5]
b) Explain how WSN is used in intelligent transportation. [5]
OR
- Q2)** a) What are different challenges in IoT? Elaborate each challenge. [5]
b) Write short note on MQTT protocol by mentioning their full form, architecture, structure and usage. [5]
- Q3)** a) What is vulnerabilities of Internet of Things? Explain in detail. [5]
b) What is WSN? Explain history of WSN. Give one example of WSN. [5]
OR
- Q4)** a) What are challenges of cloud computing? Explain each challenge. [4]
b) Explain Overview and Motivation for Internet of Things. [6]
- Q5)** a) What are special features of Raspberry Pi which make it most popular for IoT applications? What are differences between different Raspberry Pi models available? [8]
b) Write program in Python to perform following :
Input a number from user. Check if it's a prime no. Calculate its square root, square and cube. Display result in most user-friendly way. Write expected output of your program. [8]
OR
- Q6)** a) What is Arduino? What do you understand by open source hardware?
Write specifications of any Arduino board that you know. [6]

P.T.O.

- b) An ultrasonic sensor is to be interfaced with Arduino. Show the interfacing with neat diagram. Write algorithm for this interfacing. [6]
c) How powerful is Raspberry Pi? What is the SoC available for it? [4]

- Q7)** a) Define Big Data. What is need for big data analytics. [8]
b) What are characteristics of big data? Which are the data types in big data? Explain each data type by giving example. [8]

OR

- Q8)** a) List software tools which are used for data analytics. Describe features and demerits of any one. [8]
b) What are different types of data analytics? Explain each type by giving appropriate example. [8]

- Q9)** a) Explain in detail value creation in Internet of Things. [9]
b) What are some of your favorite examples of how brands are partnering with cities to address social issues? [9]

OR

- Q10)** Write short notes on following (Any three) : [18]

- a) Trends in wearable technology
b) IoT for Industrial development
c) IoT for agriculture.
d) Smart governance.



Total No. of Questions : 12]

SEAT No. :

P3307

[5461]-558

[Total No. of Pages : 2

B.E. (Electronics)

SOFTWARE DEFINED RADIO

(2015 Course) (Semester - I) (End Sem.) (Elective - I) (404204E)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if required.*
- 4) *Use of electronic nonprogrammable calculator is allowed.*

SECTION - I

Q1) a) Explain the various characteristics of the RF front-end topologies. [4]
b) Explain Duplexer & Deplexer with the help of neat block diagram. [4]

OR

Q2) a) Define AGC and list the operating modes of AGC. Draw block diagram of AGC system. [4]
b) Explain Dual Conversion Transmitter with the help of a neat diagram. [4]

Q3) Compare ASIC, FPGA and DSP hardware in SDR implementation. State and explain applications of FPGA in SDR. [6]

OR

Q4) Explain the NON-LINEAR ERRORS w.r.t. practical transfer characteristics considerations [6]

- a) INTEGRAL NON LINEARITIES [INC]
- b) DIFFERENTIAL NON LINEARITIES [DNL]

Q5) For a single stage decimator LPF, compute the approximate length & number of multiplications per second for the following specifications [6]

Sampling rate = 90 KHz

Decimation factor = 90

Passband = 0 to 450 Hz

Transition band = 450 to 500Hz

Passband ripple, $\delta P = 0.002$

Stop band ripple, $\delta s = 0.001$

OR

P.T.O.

Q6) Find the relation between $x(n)$ & $y(n)$ in frequency domain for the figure given below [6]

$$x(n) \rightarrow \textcircled{\downarrow}2 \rightarrow y(n)$$

SECTION - II

- Q7)** a) What is Cognitive Radio? What is the relation between CR and SDR. [9]
b) State the classification technique of spectrum sensing. Explain any one technique in detail. [9]

OR

- Q8)** a) List the IEEE standards P1900.X series and explain each standard in short. [9]
b) Explain the primary transmitter detection in CR. [9]

- Q9)** a) Explain the CR Architecture with the help of a basic CR system block diagram. [8]
b) Explain the following concepts with respect to cognitive radio [8]
i) Spectrum sensing-basic assignment methods
ii) Dynamic spectrum Access-mention 4 capabilities

OR

- Q10)** a) Explain Cognitive Resource Manager with the help of a reference model (Behavirourial model of CR) [8]
b) Explain the following components of CR Network Architecture [4]
i) Primary Network [4]
ii) CR Network [4]

- Q11)** a) Explain C2000 TETRA Communication. [8]
b) Explain CR in the T.V. white spaces what are the challenges and oppurtunities. [8]

OR

- Q12)** a) Explain Anti jamming performance of Cognitive Radio Network. [8]
b) Explain the challenges of using CR Technology for public safety. [8]



Total No. of Questions : 8]

SEAT No. :

P3725

[Total No. of Pages : 2

[5461] - 559

B.E. (Electronics) (Elective - II)
MOBILE COMMUNICATION
(2015 Pattern)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Attempt Q.No.1 or 2, Q.No. 3 or 4, Q.No.5 or 6, Q.No. 7 or 8.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) How we improve coverage in cellular system with the help of 120° and 60° sectoring. Explain with neat suitable diagram. [6]
- b) Explain fast and slow fading concept related with fading effect due to doppler spread. [7]
- c) Classify equalizers with neat diagram explain the working of linear transversal equalizer structure. [7]

OR

- Q2)** a) Differentiate between GPRS & EDGE Technologies. [6]
- b) Explain the three basic propagation mechanisms in a mobile communication system. [7]
- c) Explain with neat signal diagrams, the modulation and demodulation technique of QPSK. [7]

- Q3)** a) Explain the architecture of GSM. [8]
- b) Draw and explain the control channel for GSM. [8]

OR

- Q4)** a) Explain the schemes FDMA and TDMA with suitable examples. [8]
- b) Define vocoders and explain linear predictive coders. [8]

P.T.O.

- Q5)** a) In IS 95 CDMA system, if $W=1.25$ MHz, $R=9600$ bps, and $N=14$ users [8]
- Calculate E_b/N_0
 - When no voice activity is there, calculate E_b/N_o for omnidirectional antennas.
 - If voice activity is $3/8$ and three sector antennas are used, calculate the total number of users cell.
- b) Explain the capacity of cellular system in CDMA. [8]

OR

- Q6)** a) Explain the architecture of WiMAX. [8]
- b) Explain network LTE architecture. [8]

- Q7)** a) Explain fixed network transmission hierarchy. [9]
- b) Explain the architecture of ISDN. [9]

OR

- Q8)** a) Explain SS7 protocol architecture with the help of suitable diagram. [9]
- b) Explain cellular packet-switched architecture. [9]



Total No. of Questions : 08]

SEAT No. :

P3308

[Total No. of Pages : 2]

[5461] - 560

B.E. (Electronics)

BIOMEDICAL ELECTRONICS

(2015 Pattern) (404205 B) (Elective - II) (Semester - I)

Time : 2½ Hour]

[Max. Marks : 70

Instructions of the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

- Q1)** a) Explain with the help of neat diagram the Man- Instrument system. [8]
b) Explain the effect of various artifacts on recording of biomedical signal.[8]
c) Explain normal and abnormal ECG. [4]

OR

- Q2)** a) Explain functioning of heart-system with the help of piping diagram. [8]
b) With the help of two electrode equivalent circuit. Explain Measurement of biopotential and half cell potential. [8]
c) Draw the ECG wave form. Lable the critical parts of the wave form. show amplitude and time duration for normal ECG. [4]

- Q3)** a) What is blood pressure ? Explain non-invasive blood pressure measurement technique? [8]
b) What are the different methods of blood flow measurement? Explain any one with necessary diag? [8]

OR

- Q4)** a) What is fibrillation? Explain the operation of DC defibrillator with circuit diagram and wave form? [8]
b) Differentiate between External and Internal Pacemaker? [8]

P.T.O.

- Q5)** a) Explain coulter counter method of blood cell counting with diagram? [8]
b) Draw block diagram of flame photometer with it's essential parts and explain? [8]

OR

- Q6)** a) Explain grounding and shielding techniques used in medical instruments? [8]
b) Explain in detail the working of dialysis system? [8]

- Q7)** a) Explain the operation of X-Ray Machine with the help of neat block diagram & give the properties of x-ray? [10]
b) Explain application of Telemetry in patient caring. [8]

OR

- Q8)** a) What is basic principle of MRI? Explain working of MRI Machine? [10]
b) Explain in detail any two applications of LASER in medical field? [8]

@@@@@

Total No. of Questions : 08]

SEAT No. :

P3309

[Total No. of Pages : 2

[5461] - 560 - A

B. E. (Electronics)

OPTIMIZATION TECHNIQUES

(2015 Pattern) (Semester-II) (Elective-II)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions of the candidates:

- 1) Answer Q No.1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 3) Assume suitable data, if necessary.

Q1) a Use simploc method to solve:-

$$\text{Maximize } Z = 3x_1 + 5x_2 + 4x_3$$

$$\text{Subject to } 2x_1 + 3x_2 \leq 8, 2x_2 + 5x_3 \leq 10, 3x_1 + 2x_2 + 2x_3 \leq 15,$$

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

[10]

b) Reduce the system of equations.

$$2x_1 + 3x_2 - 2x_3 - 7x_4 = 2, \quad x_1 + x_2 - x_3 + 3x_4 = 12, \quad x_1 - x_2 + x_3 + 5x_4 = 8$$

into a canonical system with x_1, x_2 and x_3 as basic variables. [10]

OR

Q2) a Find the minimum of the function.

$$f(x) = 10x^6 - 48x^5 + 15x^4 + 200x^3 - 120x^2 - 480x + 100 \quad [10]$$

b) Solve the problem graphically. Maximize $f = 3x + 2y$

$$\text{Subject to } 21x - 4y \geq -36, \quad x + 2y \geq 6, \quad 6x - y \leq 72, \quad x \geq 0; y \geq 0 \quad [10]$$

Q3) a Find the minimum of the function $f(x) = 0.65 - \frac{0.75}{1+x^2} - 0.65x \tan^{-1} \frac{1}{x}$

Using unrestricted search with a fixed step size of 0.1 from the starting point 0.0. [9]

P.T.O.

- b) Find the minimum of the function $f = \frac{\lambda}{\log \lambda}$ using quadratic interpolation method (Take initial trial step length as 0.1) [9]

OR

- Q4)** a) Find the maximum of the function. $f = x^5 - 5x^3 - 20x + 5$ Using exhaustive search in the interval (0,5) [9]
 b) Find the number of experiments to be conducted in the following methods

to obtain a value of $\frac{L_n}{L_o} = 0.001$. [9]

- i) Exhaustive search.
- ii) Fibonacci method.
- iii) Golden section method.

- Q5)** Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1 x_2 + 2x_2^2$ with the starting point (0,0)
 Use.

- a) Univariate method (Take $E = 0.01$, show the computations for two search directions) [10]
 b) Using classical optimization technique. [6]

OR

- Q6)** a) Use the steepest descent method to maximize $Z = -\sin(x_1 x_2) + \cos(x_1 - x_2)$ to within a tolerance of 0.05. Take starting point. (-0.7548, 0.5303). [16]

- Q7)** Complete one iteration of the Generalized Reduced Gradient method for the problem. Minimize $f = x_1^2 + x_2^2$. Subject to $x_1 x_2 - 9 = 0$. Starting

from $X_1 = \begin{Bmatrix} 2.0 \\ 4.5 \end{Bmatrix}$ [16]

OR

- Q8)** Approximate the following problem as a quadratic programming problem at

$X = \begin{Bmatrix} 1 \\ -2 \end{Bmatrix}$ minimize $f(x) = 2x_1^3 + 15x_2^2 - 8x_1 x_2 + 15$. [16]

Subject to. $x_1^2 + x_1 x_2 + 1 = 0$, $4x_1 - x_2^2 \leq 4$.

@@@ @

Total No. of Questions : 8]

SEAT No. :

P3726

[Total No. of Pages : 2

[5461] - 560 - B

B.E. (Electronics) (Semester - I)
COMPUTER MODELLING AND SIMULATION
(2015 Pattern)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q6, Q.7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain flow diagram of service just completed. [4]
b) Explain event scheduling algorithm. [4]
c) Define and explain following terms related to discrete event simulation. [6]
 i) Model ii) Activity
 iii) Entity
d) Explain the steps to generate pseudo-random numbers. [6]

OR

- Q2)** a) What is arrival process? Explain. [4]
b) Explain multi server queuing system [4]
c) Explain Weibull and Poisson distribution. [6]
d) Identify the calling population customer & server in the following queuing situation. [6]
 i) Internet router ii) Police Station
 iii) Assembly line

- Q3)** a) With the help of flow chart explains verification of simulation models. [8]
b) Explain any two methods for selecting families of input distributions when data are available. [8]

OR

- Q4)** a) Explain four ways in detail to obtain information about a process even if data is not available. [8]
b) Explain time service input model. [8]

P.T.O.

- Q5)** a) Explain a point estimation method to measure the performance. [8]
b) Explain any one method for analysis of output for termination of simulation. [8]

OR

- Q6)** a) How the error is estimated for steady state simulation? Explain. [8]
b) Explain in details confidence interval estimation. [8]

- Q7)** a) Describe the issue in manufacturing & material handling simulation. [9]
b) With the help of diagram explain simulation of computer system. [9]

OR

- Q8)** a) With the help of diagram explain simulation of super market. [9]
b) Explain Cobweb model of simulation. [9]



Total No. of Questions : 8]

SEAT No. :

P3727

[Total No. of Pages : 2

[5461] - 560 - C

B.E. (Electronics)

DIGITAL SIGNAL PROCESSOR TMS320C67X

(2015 Pattern) (Semester - I) (Elective - II)

Time : 2 ½ Hours]

[Max. Marks : 70

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.
- 5) Use of calculators is allowed.

Q1) a) With the help of neat sketch, explain the architecture of TMS320C67X. [8]

- b) List out various interrupt control registers along with its uses. [6]
- c) Contrast and compare parallel and pipeline operations. [6]

OR

Q2) a) Discuss the following on-chip peripherals : [8]

- 1) Hardware timer
 - 2) Host Port Interface (HPI)
 - 3) Clock generator
 - 4) Serial input-output ports
- b) Discuss the computer architectures for signal processing and state the need for DSP processors. [6]
- c) What are the control register of DSP processors [6]

Q3) a) Explain PLL controller registers used in TMS320C67X. [9]

- b) Explain power-down mode in DSP processor TMS320C67X [9]

OR

Q4) a) Explain the features of the McASP and protocols the McASP supports. [9]

- b) Explain I2C Module Conceptual Block Diagram for TMS320C67X DSP processor. [9]

P.T.O.

Q5) a) Explain the need of Adaptive filter. Explain the principle of adaptive filter. [8]

b) Explain Waveform generation using TMS320C67X DSP processor [8]

OR

Q6) a) Explain how Digital filtering is implemented using TMS320C67X DSP processor [8]

b) Explain convolution implementation using TMS320C67X DSP processor [8]

Q7) a) Write a short note on Power-line monitoring using TMS320C67X DSP processor [8]

b) Explain how TMS320C67X is used in Security access. [8]

OR

Q8) a) Explain how TMS320C67X is used in Numeric control. [8]

b) Write a short note on use of TMS320C67X DSP processor in robotics. [8]



Total No. of Questions : 8]

SEAT No. :

P3665

[Total No. of Pages : 2

[5461]-561

B.E. (E&TC)

**VLSI DESIGN AND TECHNOLOGY
(2015 Pattern)**

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q. 1 or Q. 2, Q. 3 or Q.4 Q.5 or Q.6 and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Explain subprograms in detail. [6]
i) Functions and
ii) Procedures
b) Write short note on clock distribution technique. [7]
c) Draw CPLD XC9500 series architecture and explain in detail. [7]
- OR

- Q2)** a) Draw HDL design flow and explain in brief. [6]
b) Explain clock skew and write in detail about positive and negative clock skew. [7]
c) Draw and explain the architecture of FPGA XC4000 series with neat diagram. [7]

- Q3)** a) Explain CMOS inverter circuit with neat diagram and plot voltage transfer characteristics. [8]
b) Explain static and dynamic power dissipation analysis of CMOS inverter circuit. [8]

OR

- Q4)** a) Explain in detail latch up effect, latch up prevention techniques and comment on system level approach to avoid latch ups. [8]
b) Draw circuit diagram of transmission gate and explain in detail. [8]

P.T.O.

- Q5)** a) Write in detail lambda rules with diagram. [10]
b) Explain cross talk in detail. [8]

OR

- Q6)** a) Write in detail micron based design rules. [10]
b) Write short note on Layout Vs Schematic and Explain LVS checking process. [8]

- Q7)** a) What is JTAG, explain in detail. [8]
b) Explain Built in Self Test (BIST). [8]

OR

- Q8)** a) Draw and explain architecture of TAP controller. [8]
b) Describe types of faults? Explain with schematics. [8]



Total No. of Questions : 10]

SEAT No. :

P3310

[Total No. of Pages : 2

[5461] - 562

**B.E. (Electronics & Telecommunication)
COMPUTER NETWORKS AND SECURITY
(2015 Pattern) (Semester - I) (404182)**

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, and Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Draw TCP/IP protocol suite. List with example addresses present at every layer. [6]

b) Explain the Gigabit Ethernet networks. [4]

OR

Q2) a) Explain medium access control in IEEE 802.11. [6]

b) List the various protocols giving their significance at network layer. [4]

Q3) a) Explain remote and mobile host communication in mobile IP. [6]

b) Briefly define subnetting. How do the subnet mask differ from a default mask in classful addressing? [4]

OR

Q4) a) What is dynamic routing? Discuss distance vector routing. [6]

b) List and explain different types of addresses used in IPv6. [4]

P.T.O.

- Q5)** a) What are the main objectives of transport layer? Explain with neat diagram process to process delivery in transport layer. [9]
b) Explain connection establishment and connection termination with respect to the transport layer. [8]

OR

- Q6)** a) Draw the TCP header, Explain the function of each field. [9]
b) State and explain the important features of SCTP. [8]

- Q7)** a) Explain Telnet and FTP in detail with respect to server and client communication. [9]
b) What is the importance of the DNS? Explain the components of the DNS system. [8]

OR

- Q8)** a) How does electronic mail system work? What is the role of SMTP and POP-3 server in E-mail system? [9]
b) Explain how a web page is accessed through internet by a browser. [8]

- Q9)** a) What is cryptography? Explain in brief substitution cipher and transposition cipher. [8]
b) Explain the RSA algorithm with suitable example. [8]

OR

- Q10)** a) Explain the various security features offered by PGP. [8]
b) Explain the utility and security aspects in digital signature. [8]



Total No. of Questions : 8]

SEAT No. :

P3728

[Total No. of Pages : 2

[5461] - 563

B.E. [E & Tc] (Semester - I)
RADIATION & MICROWAVE TECHNIQUES
(2015 Pattern)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data; if necessary.
- 5) Use of calculators is allowed.

- Q1)** a) Define the antenna polarization and explain linear, circular, elliptical polarization with relevant expressions and illustrative diagrams. [8]
b) Explain the construction and principle of operation for Yagi Uda antenna. [6]
c) For an air filled rectangular wave guide of dimensions $a = 2\text{cms}$ and $b=1\text{cms}$. Calculate cutoff wavelength for TE_{10} and TM_{11} mode. Also calculate guide wavelength at 10GHz. [6]

OR

- Q2)** a) For an array of four isotropic sources along z axis separated by a distance of $\lambda/2$ and a progressive phase shift of $\alpha = 0$, find null direction, maxima direction, direction of side lobe maxima and HPBW. [8]
b) Define & explain following Antenna parameters [6]
i) Directivity
ii) Effective Area
iii) Gain
c) Why waveguides are required at microwave frequencies? Explain following parameters of waveguide. [6]
i) Cutoff frequency
ii) Guide wavelength

- Q3)** a) Explain the properties of E plane Tee with the help of neat diagram. Also derive its Scattering matrix. [8]
b) Explain faraday's rotation principle. Explain in brief the working principle of an isolator. [8]

OR

P.T.O.

- Q4)** a) Define with expressions the following parameters of directional coupler. [6]
- Coupling factor
 - Directivity
 - Insertion loss
- b) A signal of power 32mw is fed into one of the collinear ports of a loss less H plane Tee. Determine the power in the remaining ports when [6] other ports are terminated by means of matched load.
- c) Explain the operation of circulator using two magic tees. [4]

- Q5)** a) What are linear beam tubes? Explain construction, operation & advantage of TWT amplifier? [8]
- b) Explain Gunn effect with the help of two valley model. Also explain V-I characteristics and applications of Gunn diode. [8]

OR

- Q6)** a) With the help of construction & applegate diagram explain working of Reflex Klystron? [8]
- b) Explain working principle of Tunnel diode. [8]

- Q7)** a) Explain Microwave Satellite Communication System. Also differentiate between Satellite and Terrestrial Communication System. [10]
- b) Explain measurement techniques for VSWR. [8]

OR

- Q8)** a) Explain with neat block diagram power measurement of microwave generator using; [10]
- Bolometer
 - Calorimeter.
- b) Explain attenuation measurement using power ration measurement technique. What is the drawback of power ration measurement technique for attenuation measurement? Explain attenuation measurement using RF substitution method. [8]



Total No. of Questions : 10]

SEAT No. :

P3729

[Total No. of Pages : 2

[5461] - 564

B.E. (E & TC)

**DIGITAL IMAGE AND VIDEO PROCESSING
(2015 Pattern) (Elective - I)**

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.No. 1 or 2, Q.No. 3 or 4, Q.No. 5 or 6, Q. No. 7 or 8, Q. No. 9 or 10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data if necessary.

- Q1) a)** With respect to image processing explain following terms. [6]
- i) Gray level resolution.
 - ii) Spatial resolution.
 - iii) Connectivity of pixels.
- b)** What is color model? Compare RGB and YIQ color model with their application. [4]

OR

- Q2) a)** Explain following concepts in image enhancements, with appropriate applications. [6]
- i) Gray level slicing. ii) High boost filtering.
- b)** What is fidelity criteria with respect to image compression. Hence explain subjective and objective fidelity criteria. [4]

- Q3) a)** With reference to image compression and with appropriate example explain Arithmetic coding in detail. [4]
- b)** A skilled medical technician is given a job of examining medical images of human nucleus. He observes following problems in images.
- i) Presence of bright isolated dots which is not of interest.
 - ii) Poor contrast.

Comment on suitable image processing steps that technician may use to overcome these problems. [6]

OR

- Q4) a)** What is pseudo coloring and what are the various pseudo coloring techniques used for image enhancement. [4]

P.T.O.

- b) In transform based image compression, image is sub-divided into smaller sub images. Discuss the effect of sub image size on : [6]
- Compression performance.
 - Computational complexity.

- Q5)** a) Explain and compare Gradient and Laplacian operators for edge detection. Derive the mask for Laplacian edge detector. [10]
- b) Discuss the meaning of morphology with reference to an image. Describe the effects and applications of the following morphological operation [8]
- Opening
 - Closing
- OR

- Q6)** a) Explain the following algorithms of image segmentation. [10]
- Region growing.
 - Region splitting and merging.
- b) What is global thresholding? What is its drawback? How adaptive thresholding overcome this drawback? Write algorithm for adaptive thresholding. [8]

- Q7)** a) Explain the concept of image representation. Describe the image representation by signature & shape number with example. [8]
- b) What are chain codes and how they are used for boundary representation? Draw shape for following chain code. [8]
- 22 06 06 44
 - 22 11 77 66 44
- OR

- Q8)** a) Describe the basic concept of fourier descriptor for representation of boundary. List its properties and advantages. [8]
- b) Explain the concept of principal components. How they are used for region representation. [8]

- Q9)** a) What are the requirements of digital video? Why video compression is required? Explain with suitable example. [8]
- b) Explain block based motion estimation and compensation technique. What are advantages & disadvantages of this technique. [8]
- OR

- Q10)** a) Draw and explain hybrid video code. [8]
- b) Why digital color videos are converted into $Y\bar{C}_b\bar{C}_r$ color spaces? Hence explain 4 : 4 : 4, 4 : 2 : 2 and 4 : 2 : 0 $Y\bar{C}_b\bar{C}_r$ sampling formats. [8]



Total No. of Questions : 8]

SEAT No. :

P3730

[Total No. of Pages : 2

[5461] - 565

B.E. [E & Tc]

**INDUSTRIAL DRIVES AND CONTROL
(2015 Pattern)**

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data; if necessary.

Q1) a) Which type of drive is suitable for paper mill? Explain the operation in detail. [6]

b) The speed of a 10 HP, 210V, 1000 rpm separately excited dc motor is controlled by a single phase full converter. The rated armature current is 30A and the armature resistance is 0.25Ω . The ac supply voltage is 230V. The motor voltage constant $K_a \phi = 0.172$ V/rpm. Assume that sufficient inductance is present in the armature circuit to make the motor current continuous and ripple free. For firing angle of 45° and rated motor armature current calculate : [8]

- i) The motor torque
- ii) The speed of motor

c) Explain the implementation of regenerative braking for 3 phase VFD drive system using suitable power electronics converter. [6]

OR

Q2) a) Explain the selection of motor power rating for different loading conditions, [6]

b) Compare chopper fed and converter fed dc drives. [6]

c) Explain the speed control of 3 phase induction motor drive using 3 phase 180° mode inverter and also explain how to achieve V/F control using this scheme. [8]

Q3) a) Draw and briefly explain the torque speed characteristics of synchronous reluctance motor at constant voltage and frequency. [6]

b) Explain the operation of Servo motor drive with suitable block diagram. State the application where servo drives are preferred. [6]

- c) Compare salient pole motor and permanent magnet motor. [6]
OR

Q4) a) With the help of a neat circuit diagram and waveforms explain the operation of three phase brushless dc motor drive. State its applications. [10]

- b) Draw and explain various power converter configurations for switched reluctance motor. [8]

Q5) a) Discuss the following with respect to Solar PV System. [8]

- i) VI characteristics of Solar cell
- ii) Power of a solar panel
- iii) Efficiency of a solar cell

- b) Explain the principle of Wind Energy Conversion System (WECS) with doubly fed induction generator. State the basic components of WECS and their role. [8]

OR

Q6) a) With the help of neat block diagram explain stand alone and grid connected solar power system [8]

- b) Explain the applications of Wind Energy Conversion System (WECS) in
 - i) Battery charging [8]
 - ii) Stand alone AC load system

Q7) a) What is Neuro fuzzy system? Explain how fuzzy logic can be used in power electronics industry with suitable example. [8]

- b) Explain the operation of neural network based PWM controller. [8]

OR

Q8) a) Explain the operation of neural network based control system. Explain general design methodology of neural network based control system. [8]

- b) Explain the role of Fuzzy logic in indirect vector controlled 3 phase induction motor drive with flux programming efficiency optimizer. [8]



Total No. of Questions : 10]

SEAT No. :

P3311

[5461]-566

[Total No. of Pages : 2

B.E. (E&TC)

EMBEDDED SYSTEM & RTOS

(2015 Course) (Semester - I) (End Sem.) (Elective - I) (404184C)

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) What are the challenges in design of embedded system. [5]
b) Explain the spiral model. State its merits and demerits. [5]

OR

- Q2)** a) What is shared data problem? Explain any two methods to avoid it. [5]
b) How embedded C programming is different than ANSI C programming. [5]

- Q3)** a) Explain the architecture of µCOS II kernel. [5]
b) Explain the following functions : [5]
i) OSQPost()
ii) OSSemAccept()

OR

- Q4)** a) Explain the foreground/background system. [5]
b) Explain a suitable scheduling algorithm used in RTOS. [5]

- Q5)** a) Compare ARM7 with ARM CORTEX(M3). [8]
b) With the help of features, justify the use of CORTEX architecture in modern embedded system. [8]

OR

P.T.O.

- Q6)** a) Explain NVIC interrupt structure in cortex architecture. How tail chaining method improves the interrupt response time. [8]
- b) Draw and explain interfacing of RGB LED with LPC1768. Write a program for the same. [8]

- Q7)** a) What is embedded Linux? Explain various components of embedded Linux. [9]
- b) Explain typical set up for embedded Linux application development. [9]

OR

- Q8)** a) What are boot loader challenges in embedded Linux. [9]
- b) Explain concept of device driver. What are module utilities? Explain any two module utilities. [9]

- Q9)** a) What are the features of ATMega328P based Arduino Uno board? [8]
- b) Explain Linux kernel architecture with a diagram. [8]

OR

- Q10)** a) Explain structure of Arduino program? Write a program to blink a LED connected to any port of Arduino board. [8]
- b) Why Linux is preferred choice for development of embedded system applications. [8]



Total No. of Questions : 8]

SEAT No. :

P3312

[5461]-567

[Total No. of Pages : 2

B.E. (E&TC)

INTERNET OF THINGS

(2015 Pattern) (Semester - I) (End Sem.) (Elective - I) (404184D)

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*

Q1) a) What are various functional blocks of IoT? Describe them in one sentence each. What are various Communication Models in IoT? Describe any two of them. [8]

- b) Explain any two sensors and their use in IoT. [6]
- c) What is Z-Wave? Explain the two types of nodes in Z-Wave. [6]

OR

Q2) a) Elaborate how identifiers play an important role in IoT. [8]

- b) Explain the RFID middleware architecture. [6]
- c) What is NFC? How is it useful in IoT/M2M applications? [6]

Q3) a) What is 6LowPAN? Write a brief overview of 6LowPAN adaptation Layer [8]

- b) Explain the AMQP protocol and its use in IoT systems. [8]

OR

Q4) a) What is RPL? Explain how it is useful in IoT implementations. [8]

- b) What are the various features of CoAP? Explain any two types of Messages in CoAP. [8]

P.T.O.

- Q5)** a) Compare Conventional Big Data and IoT generated Big Data. [8]
b) There are two types of data analytics techniques namely qualitative and quantitative. Explain what these techniques are and compare them. [8]

OR

- Q6)** a) A Cloud-based IoT platform is a dynamic and flexible resource sharing platform delivering IoT services. Elaborate on the three service models used in Cloud- based IoT platform. [8]
b) Elaborate on any one quantitative data analytics technique. [8]

- Q7)** a) Explain how you will design a smart water management system for agriculture using IoT. [10]
b) Elaborate on how you will use IoT for remote healthcare. [8]

OR

- Q8)** a) Explain how will you design an energy management system in a commercial building using IoT. [10]
b) What is Industrial IoT? How it is different from Conventional IoT? [8]



Total No. of Questions : 8]

SEAT No. :

P3731

[Total No. of Pages : 1

[5461] - 568

B.E. [E & TC] (Elective - II)
WAVELETS
(2015 Pattern)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

1) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

2) Assume suitable data; if necessary.

- Q1)** a) Explain Banach spaces and its link to continuous fourier transform. [10]
b) Explain uncertainty principle with one example. [10]

OR

- Q2)** a) Explain the need for STFT. What is the effect of window size on the resolution of STFT. [10]
b) Explain tiling diagram of contunous time fourier transform, STFT and wavelet transform. [10]

- Q3)** a) Derive the magnitude and phase response of Harr second order LPF & HPF. [12]
b) Explain the need for multirate signal processing. [6]

OR

- Q4)** Given $x(n) = \{9, 7, 4, 8\}$ EV₂. Develop wavelet lifting scheme, using MRA framework decompose the signal to the zeroth subspace show perfect reconstruction. [18]

- Q5)** Give the overview of various Image compression techniques. Explain JPEG coding scheme of compression with block diagram. [16]

OR

- Q6)** a) Explain the axioms of MRA [8]
b) How video coding can be done using MRA technique. [8]

- Q7)** a) Explain scaling and delation of Harr wavelet in time and frequency domain. [8]
b) What is image enhancement and how wavelets can be used for the same. [8]

OR

- Q8)** Explain with block diagram the use of wavelets in [16]
a) Spectile removal
b) Multitone modulation.



Total No. of Questions : 8]

SEAT No. :

P3732

[Total No. of Pages : 2

[5461] - 569

B.E. (E & TC) (Elective - II)
Electronic Product Design
(2015 Pattern)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Attempt Q.No. 1 or 2, Q.No. 3 or 4, Q.No 5 or 6 & Q.No. 7 or 8.*

- Q1)** a) Discuss noise coupling mechanisms and how to minimize these at circuit board. [6]
b) What is the significance functional model? Explain with example. [6]
c) In finding software faults in real time embedded system explain the features and limitations of debugger, simulator and emulators. [8]

OR

- Q2)** a) What is need of shielding explain with suitable example? [6]
b) What is importance of design specifications in product design? [6]
c) Explain different stages in software development at which bugs may enter and list common bugs and ways to eliminate them. [8]

- Q3)** a) What are different sources of ESD and how to minimize ESD. [8]
b) Write a short note on followings: [10]
i) Radiated and conducted Immunity.
ii) Grounding methodologies in PCB design.

OR

- Q4)** a) Explain PCB termination techniques for high frequency design. [6]
b) Write a note on Critical Frequencies of PCB. [6]
c) What are the design techniques used to prevent crosstalk. [6]

- Q5)** a) Explain how different blocks are partitioned in complicated circuit. [6]
b) Explain how conducted EMI and radiated EMI originate. [4]
c) What are the different steps in the debugging? Differentiate the troubleshooting from debugging? [6]

P.T.O.

OR

- Q6)** a) State importance of EMI/EMC test and give typical set up. [8]
b) Compare different types of ADCs with respect to resolution, power consumption, multiple inputs and nonlinearity. [8]

- Q7)** a) Explain in brief accountability and liability of documents in product design. [8]

- b) What is importance of PCB fabrication drawing and wiring diagram. [8]

OR

- Q8)** a) Differentiate schematic diagram and interconnection diagram. [8]
b) Write a short note on followings :
i) Engineering notebook.
ii) Service manual.



Total No. of Questions : 8]

SEAT No. :

P3733

[Total No. of Pages : 2

[5461] - 570

B.E. [E & TC] (Elective - II)
OPTIMIZATION TECHNIQUES
(2015 Pattern)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 2) Assume suitable data, if necessary.

Q1) a) Minimize :

[10]

$$f = x_1^2 + 2x_2^2 + 3x_3^2$$

Subject to $g_1 = x_1 - x_2 - 2x_3 \leq 12$

$$g_2 = x_1 + 2x_2 - 3x_3 \leq 8$$

Using KKT conditions

b) Maximize $f = 6x + 7y$

[10]

Subject to $7x + 6y \leq 42$

$$5x + 9y \leq 45$$

$$x - y \leq 4$$

$$x \geq 0, y \geq 0$$

Using simplex Method

OR

Q2) a) Find the solution graphically. Also find the dual of the given problem.[10]

Maximize $f = 2x_1 + 6x_2$

Subject to $-x_1 + x_2 \leq 1$

$$2x_1 + x_2 \leq 2$$

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

b) State and explain decomposition principle with example.

[10]

P.T.O.

- Q3)** a) Find the minimum using fibonacci method $f(x) = x^2 - 2x$ within the interval of uncertainty $0.25 \angle 0$ where $\angle 0$ is the original interval of uncertainty $[0 \leq x \leq 1.5]$ [8]
- b) Find the minimum of $f_1 = x(x-1.5)$ by starting from 0.0 with a initial step size of 0.06 [8]
- use unrestricted search method.
 - Find the minimum of f_1 using classical optimization technique.
- OR

- Q4)** Solve the following problem using the powell's quadratic Interpolation method minimize : [16]

$$f(\lambda) = (1-2\lambda)^4 - 3(1-2\lambda)(2-11\lambda) - 2(2-11\lambda)^2$$

Also determine the error

- Q5)** a) Minimize $f(x_1, x_2) = x_1^2 - x_1x_2 + 3x_2^2$ using the univariate method. Take starting point (1,1). Show computations upto three iterations. [9]
- b) Minimize $f(x_1, x_2) = x_1^2 - 2x_1 + 1 + x_2^2$ using the steepest descent method. Take starting point (0,0). Show computations upto two iterations. [9]
- OR

- Q6)** a) Minimize $f(x_1, x_2) = x_1^2 - 2x_1 + 1 + x_2^2$ using Newton Raphson method. Take starting point (0,0) show computations upto two iterations. [9]
- b) Minimize :

$$f = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2 \text{ starting with } X_1 = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \text{ using conjugate gradient method. Show computations upto three Iterations.} [9]$$

- Q7)** a) How Genetic Algorithm differ from the traditional methods of optimization. Explain crossover operation with example . [8]
- b) Explain the principle of particle swarm optimization and Ant colony method. [8]

OR

- Q8)** a) Explain with example fuzzy union, intersection and complement operations. [8]
- b) Explain simulated annealing method of optimization. Why the method is called simulated annealing. [8]



Total No. of Questions : 10]

SEAT No. :

P3313

Total No. of Pages : 2

[5461] - 570 - A

B.E. (Electronics & Telecommunication)

ARTIFICIAL INTELLIGENCE

(2015 Pattern) (Semester - I) (Elective - II) (End Sem.) (404185 D)

Time : 2 ½ Hours

[Max. Marks : 70]

Instructions to the candidates:

- 1) Answer questions Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7, or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Discuss the structure of Model based agents. [5]

b) Explain Alpha-Beta Pruning with an example. [5]

OR

Q2) a) Discuss the following environments: [5]

- i) Fully observable versus partially observable.
- ii) Deterministic versus Stochastic.

b) Explain Genetic algorithm. [5]

Q3) a) Explain the various steps of knowledge engineering process. [5]

b) Draw and explain the state space for vacuum world. [5]

OR

Q4) a) What is heuristic search? Explain with example. [5]

b) Explain various operators used in propositional logic for knowledge base building. [5]

Q5) a) Explain [8]

- i) Supervised learning.
- ii) Unsupervised Learning.

P.T.O.

- b) Draw and explain simple mathematical model of neuron. Implement AND, OR and NOT logic using single neuron. [8]

OR

- Q6)** a) Explain k-nearest neighbor model. [8]
b) Explain EM algorithm for learning with hidden variables. [8]

- Q7)** a) Write the note on. [10]
i) Principal Component Analysis (PCA).
ii) Linear Discriminant Analysis (LDA).

- b) Write a note on pattern mining. [8]

OR

- Q8)** a) Explain following techniques for object recognition: [10]
i) Prototype matching theory.
ii) Structural description.
iii) Feature-based approach.

- b) With the help of a neat block diagram, explain speech recognition system. [8]

- Q9)** a) Explain semantic analysis in NLP. [8]
b) Explain following terms: [8]
i) Context-free grammar.
ii) Parsing.
iii) Transformational grammar.
iv) Augmented Transition Networks (ATN).

OR

- Q10)**a) What is an information retrieval system? Explain any two models of information Retrieval. [8]
b) With the help of a neat block diagram, explain the steps of machine translation in NLP. [8]

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Total No. of Questions : 08]

SEAT No. :

P3314

[Total No. of Pages : 2

[5461] - 570 - B

B. E. (Electronics & Telecommunication)

ELECTRONICS IN AGRICULTURE

(2015 Pattern) (Semester-I) (Elective-II) (End Sem)

Time : 2 ½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Black figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain data flow techniques in Virtual Instrumentation. [7]
b) Draw and explain architecture of PLC. [6]
c) What are different techniques for humidity measurement? Explain any one. [7]

OR

- Q2)** a) Draw and explain the block diagram of data Logger System. [7]
b) Write comparision between HART & Field foundation network. [6]
c) Explain in detail instrument used for temperature measurement in agriculture. [7]

- Q3)** a) What is Precision farming? What are the objectives of it? Explain yield monitoring w. r. t. Precision farming. [8]
b) What is the significance of GIS & GPS in precision farming? Explain in brief [8]

OR

- Q4)** a) Explain in detail various issues & challenges in precision farming. [8]
b) What is necessity of soil sampling in precision farming? [4]
c) Explain Role of Electronics in Farm machinery for precision farming. [4]

P.T.O.

- Q5)** a) Explain in brief Soil-moisture measurement and monitoring. [6]
b) What is crop spraying? Explain in detail. [6]
c) Explain Irrigation control systems in agriculture. [6]

OR

- Q6)** a) Explain in detail with block diagram Green house environment control system. [6]
b) Explain in brief Instruments used for protection of cultivation. [6]
c) What is need of crop monitoring & Give the details of instrument used for it. [6]

- Q7)** a) Explain the importance of crop preservation w. r. t. various commodities & parts of plants. [8]
b) Explain the role of Electronics Governance in agricultural sector in detail. [8]

OR

- Q8)** a) Describe various Governance products & services in agriculture sector. [8]
b) Explain Electronic control system for grape drying process. [8]

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Total No. of Questions : 10]

SEAT No. :

P3315

[5461]-571

[Total No. of Pages : 3

B.E. (Electrical Engg.)

**POWER SYSTEM OPERATION & CONTROL
(2015 Course) (Semester - I) (End Sem.) (403141)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Discuss the use of swing equation of synchronous machine in power system stability study. [5]
- b) Describe the concept of sub synchronous resonance and reasons of its occurrence. [5]

OR

- Q2)** a) Derive the expression of critical clearing angle and critical clearing time. [6]
- b) Enlist and describe in brief the methods for improvement of transient stability limit. [4]

- Q3)** a) Explain the circuit, VI characteristics, advantages and limitations of TCSC. [8]
- b) State the criteria applied while using series and shunt compensation. [2]

OR

- Q4)** a) Elaborate the point by point method used in power system stability studies. [6]
- b) Explain the use of synchronous condenser for reactive power management. [4]

- Q5)** a) With block diagram of proportional plus integral load frequency control, explain the dynamic response of change in frequency as function of change in load, in case of single area case. [10]

P.T.O.

- b) Explain following concepts with reference to Automatic Generation Control (AGC) [8]
- Single Control Area
 - Free Governor Mode of operation
 - Area Control Error in single area case
 - Area Control Error in two area case

OR

- Q6)** a) With block diagram of Load frequency control of two area case, explain the dynamic response of change in frequency as well as tie line power as a function of change in load. [10]
- b) Draw and explain the working of speed governor system of turbo generator. [8]

- Q7)** a) Define Unit Commitment. Enlist the methods to solve Unit Commitment. Explain the recursive function used in dynamic programming of UC task. [8]
- b) Use dynamic programming and obtain the Unit Commitment table of two generating units of load demand of 2MW and 3MW. The cost curve of each generating unit is given. The load is changed in a step of 1MW. [8]

$$C_1 = 0.8 * P_1^2 + 25 * P_1 + 120$$

$$C_2 = 1.2 * P_2^2 + 22 * P_2 + 100$$

OR

- Q8)** a) Define Economic Load Dispatch. Explain the use of Lagrange multiplier technique to solve load dispatch problem in case of including generator limit and without including transmission line loss. [8]
- b) The cost curve of three thermal units in Rs/hr, are given as follows; [8]

$$C_1 = 0.004 * P_1^2 + 5.3 * P_1 + 500$$

$$C_2 = 0.006 * P_2^2 + 5.5 * P_2 + 400$$

$$C_3 = 0.009 * P_3^2 + 5.8 * P_3 + 200$$

Neglect the transmission loss and generator limits. Find the optimum dispatch of 800 MW and 975 MW using coordination equation.

Q9) Write short note on any 4 of following.

[16]

- a) Economy interchange evaluation in case of interconnected systems
- b) Energy Banking
- c) Power Pool
- d) Capacity Interchange
- e) Diversity Interchange

OR

Q10)a Define the reliability of power system. Calculate the system failure rate - λ_{para} , Unavailability - U_{para} and interruption duration - r_{para} of parallel distribution system. The data of two lines is given as follows **[6]**

$$\lambda_1 = 0.5/\text{yr}, \lambda_2 = 1/\text{yr}, r_1 = 25\text{hrs}, r_2 = 10 \text{ hrs}$$

b) Along with mathematics, discuss the reliability evaluation of following indices; **[10]**

- i) Loss of load probability(LOLP)
- ii) Loss of load expectation(LOLE)
- iii) Expected Energy Not Supplied(EENS)
- iv) System Average Interruption Frequency Index(SAIFI)
- v) System Average Interruption Duration Index(SAIDI)



Total No. of Questions : 8]

SEAT No. :

P3316

[Total No. of Pages : 2

[5461] - 572

B.E. (Electrical)

PLC AND SCADA APPLICATIONS

(2015 Course) (Semester - I) (403142) (End Sem.)

Time : 2½ Hours

/Max. Marks : 70

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.

Q1) a) Draw and explain operational sections of CPU. [7]

b) Explain output analog devices. [7]

c) Explain Retentive Timer (RTO) with all its bits on the ladder diagram and timing diagram. [8]

OR

Q2) a) State various advantages and disadvantages of PLC. [8]

b) Explain any one type of sensor used for measurement of temperature. [6]

c) Draw the ladder diagram for the following function table [8]

Inputs – 11, 12 Outputs- Q1, Q2, Q3, Q4

I1	I2	Q1	Q2	Q3	Q4
0	0	0	1	0	0
0	1	0	0	1	1
1	0	0	0	1	1
1	1	1	1	0	1

P.T.O.

Q3) a) Explain analog signal processing. Assume input 0 to 78 VAC, input module 0 to 5 V DC, 8 bit base. How 61.5 V AC input voltage is converted and scaled to CPU input register? [8]

b) Explain the effect of change of integral gain K_i and derivative gain K_d of PID controller on the response of the system. [8]

OR

Q4) a) Write a short note on DC motor controller. [8]

b) Explain speed control of DC motor using PLC with block diagram only. [8]

Q5) a) Draw and explain SCADA architecture in detail. [8]

b) State applications of SCADA system. [8]

OR

Q6) a) Write a short note on Energy Management Systems (EMS). [8]

b) Explain SCADA system application in water purification system. [8]

Q7) a) Write a short note on flexible function block (FFB). [8]

b) Write a short note on EtherNet/IP protocol. [8]

OR

Q8) a) Write a short note on Control and Information Protocol (CIP). [8]

b) Explain DNP3 protocol. [8]



Total No. of Questions : 8]

SEAT No. :

P3317

[Total No. of Pages : 3

[5461]-573

B.E. (Electrical)
CONTROL SYSTEM - II
(2015 Pattern) (Semester-I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain in detail ZOH and FOH operation. Draw suitable diagrams. [6]
b) Obtain inverse z transform using partial fraction method. Given that

$$\dot{X}(Z) = \frac{1+3z^{-1}}{1+3z^{-1}+2z^{-2}} \quad |z| > 2. \quad [6]$$

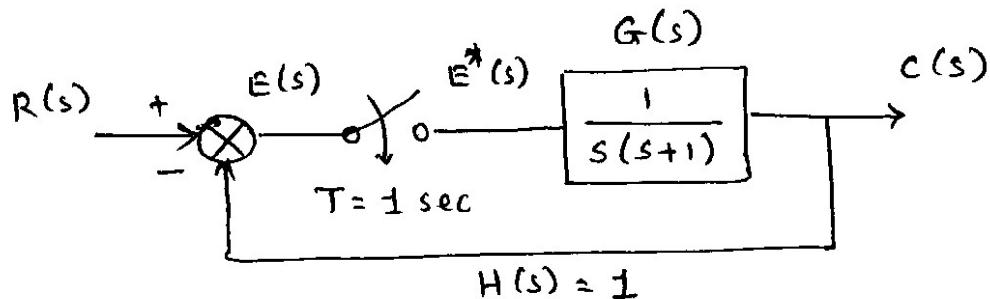
- c) Using Jury stability test comment on the stability of the system described by the characteristic equation. [8]

$$z^4 + 3.5z^3 + 5z^2 + 2z + 0.5 = 0$$

OR

- Q2)** a) State and explain Shannon's Sampling theorem. Also discuss aliasing effect. [6]
b) Explain with neat diagrams direct digital programming and standard digital programming. [6]
c) Obtain the Z-transfer function for the following closed loop system using the relation [8]

$$\frac{C(Z)}{R(Z)} = \frac{G(Z)}{1+GH(Z)}$$

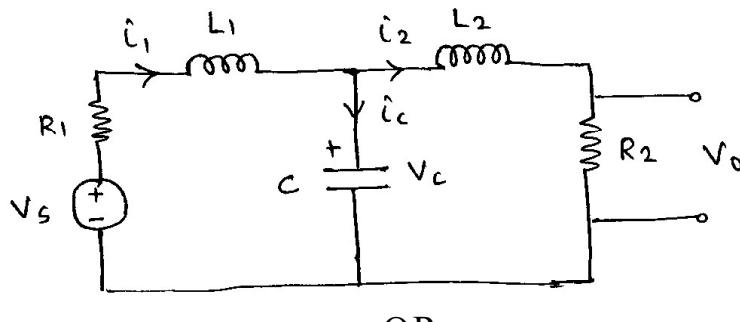


P.T.O.

- Q3)** a) State advantages of state space representation over transfer function approach. [4]
b) With block diagram representation and writing down necessary equations, obtain state model in phase variable form for following transfer function.

$$\frac{Y(s)}{U(s)} = \frac{25}{(s+1)(s+4)(s+5)} \quad [6]$$

- c) Obtain the state model for following electrical network. Choose i_1 , i_2 and V_c as state variables. [8]



- Q4) a) Convert the given state model into transfer function. [4]

$$\dot{X} = \begin{bmatrix} -4 & -1.5 \\ 4 & 0 \end{bmatrix} X + \begin{bmatrix} 2 \\ 0 \end{bmatrix} u \text{ and } y = [1.5 \quad 0.625] X$$

- b) Define the terms [6]

 - i) state
 - ii) state variables
 - iii) state vector
 - iv) state space

c) Explain in detail canonical and Jordan canonical form of state space representation. Also draw suitable diagrams. [8]

- Q5) a)** Obtain state transition matrix (STM) using cayley Hamilton theorem.

Given that $A = \begin{bmatrix} 0 & 1 \\ -8 & -6 \end{bmatrix}$ [6]

- b) Diagonalize following system using modal matrix and obtain \bar{A} and \bar{B} . [10]

$$\dot{X} = \begin{bmatrix} 0 & 1 & -1 \\ -6 & -11 & -6 \\ -6 & -11 & 5 \end{bmatrix} X + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

OR

- Q6)** a) State and derive properties of state Transition Matrix. [6]
 b) Obtain state response and output response for the system represented by the homogeneous state equation. [10]

$$X = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix} X \text{ and } y = [1 \ 1] X \text{ Take } X_0 = [1 \ 1]^T.$$

- Q7)** a) What is Gilbert's test for observability? Explain the same for following cases – [8]
 i) Distinct eigenvalues
 ii) Repeated eigenvalues
 iii) MIMO system
 b) Design a state feedback gain matrix K for the following system using Ackermann's formula if it is desired to place the poles at $-3 \pm j2$. [8]

$$\dot{X} = \begin{bmatrix} -1 & 0 \\ 1 & -2 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$$

OR

- Q8)** a) Explain with proof Duality property. Write a state model for dual system of following [8]

$$\dot{X} = \begin{bmatrix} 0 & 1 \\ -12 & -7 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = [1 \ -2]x$$

- b) Using suitable diagram explain the need and concept of state Observer. [8]



Total No. of Questions : 10]

SEAT No. :

P3734

[Total No. of Pages : 2

[5461] - 574

B.E. (Electrical) (Semester - I)

**FUNDAMENTALS OF MICROCONTROLLER MSP430 &
ITS APPLICATIONS (Elective - I)
(2015 Pattern)**

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 & Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Draw and explain memory map of MSP430 microcontroller. [6]
b) Draw neat diagram the status register of a MSP430 microcontroller. [4]
OR
- Q2)** a) Interface an LED with MSP 430 and write a program of blinking display
of LED Using suitable software delay. [6]
b) Differentiate between RISC and CISC architecture. [4]
- Q3)** a) Write a note on application development tools used for MSP430
microcontroller. [6]
b) Explain the port structure of MSP430 microcontroller. [4]
OR
- Q4)** a) Explain the capture mode of MSP430 microcontroller. [6]
b) Explain the operation and use of Watch dog timer in MSP430
microcontroller. [4]
- Q5)** a) Explain the low power modes of MSP430 microcontroller. [8]
b) Explain the basic operation of the ADC10. [8]
OR
- Q6)** a) Explain working of DAC 12 of MSP430 microcontroller. [8]
b) Explain the following functions associated with A to D converter. [8]
i) Sample and Hold
ii) Filtering

P.T.O.

- Q7)** a) Explain Universal Serial Communication Interface(USCI) in MSP430. [8]
b) Write a short note on UART protocol. [9]
- OR
- Q8)** a) With a neat diagram explain the SPI protocol of data transfer. [8]
b) Write a short note on I2C protocol. [9]
- Q9)** a) Write a short note on wireless sensor network. [8]
b) Write a short note on NFC (Near Field Communication) protocol. [9]
- OR
- Q10)** a) Write a short note on ZigBee communication protocol. [8]
b) Explain with a block diagram how a Smart Electric meter can be implemented using MSP430 microcontroller. [9]



Total No. of Questions : 10]

SEAT No. :

P3318

[5461]-575

[Total No. of Pages : 2

**B.E. (Electrical)
POWER QUALITY**

(2015 Course) (Semester - I) (End Sem.) (Elective - I) (403143B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicates full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Why power quality is gaining importance now a days? [5]

b) Classify power quality events in long duration events and shout duration events. [5]

OR

Q2) a) Discuss how power quality is affected due to grounding problems. [5]

b) Differentiate between transients and harmonics. [5]

Q3) a) Explain economic impact of voltage sag. [5]

b) Discuss in brief flicker mitigation techniques. [5]

OR

Q4) a) List techniques are used for voltage sag mitigation and explain any one in brief. [5]

b) Explain the following terms with reference to transient overvoltage [5]

i) Capacitor switching

ii) Ferro resonance

Q5) a) Explain harmonic indices used in analyzing harmonic distortion. [6]

b) Explain the waveform distortion due to different nonlinear loads. [10]

OR

P.T.O.

Q6) a) Explain impact of harmonics on various power system quantities. (Voltage, Current, Power). [8]

b) Write a short note on triplen harmonics. [8]

Q7) a) What are the harmonic resonances? Explain consequences of harmonic resonances. [8]

b) What are the harmonic mitigation techniques? Explain any one. [8]

OR

Q8) a) Write a short note on IEEE 519 standard for harmonic distortion. [8]

b) What is the need of locating harmonic sources? How capacitors affect the power system characteristics? [8]

Q9) a) Discuss in detail about the instruments used for analyzing non sinusoidal voltage and currents. [10]

b) What computer tools are used for effective power quality analysis? Explain. [8]

OR

Q10)a) Bring out the significance of Power quality monitoring. What is the important power quality monitoring objectives? [10]

b) Explain the harmonic analyzer and disturbance analyzer. [8]



Total No. of Questions : 8]

SEAT No. :

P3319

[5461]-576

[Total No. of Pages : 3

B.E. (Electrical)

RENEWABLE ENERGY SYSTEMS

(2015 Course) (End Sem.) (Elective - I) (Semester - I)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) a) Define [5]

- i) Solar constant
- ii) Latitude
- iii) Irradiance
- iv) Declination
- v) Slope

b) Explain briefly the factors affecting electrical design of solar array. [5]

c) What are the different components of standalone PV system? [5]

d) Find the diameter of a wind turbine to generate 4kW at wind speed of 7m/s & a rotor speed of 120 rpm. Assume $C_p = 0.4$, $\eta_m = 0.9$, $\eta_{gen} = 0.95$. [5]

OR

Q2) a) What is light concentration? Hence define concentration ratio. [5]

b) Compare single crystalline and polycrystalline PV cell. [5]

c) Define [5]

- i) Tip speed ratio
- ii) Pitch control
- iii) Power coefficient
- iv) Cut-out speed
- v) Yaw control

d) A horizontal axis wind turbine has a diameter of 5m. When wind speed unaffected by the turbine is 9m/s, the turbine rotates at 300rpm & gives 3kW of mechanical power. Determine C_p .(Take $\rho = 1.223 \text{ kg/m}^3$) [5]

P.T.O.

Q3) a) What are the Biomass Resources? Explain with the help of block diagram a biomass based power generation. [8]

b) Explain any one gasifier in detail with neat diagram. [8]

OR

Q4) a) Discuss the method of power generation from liquid waste. [8]

b) The following data is given for biogas digester suitable for the output of five cows-retention time is 20 days, temperature 30°C, and dry matte consumed per day = 2 kg, Biogas yield is 0.24 m³ per kg. efficiency of burner is 60%, methane proportion is 0.8, Heat of combustion of methane = 28 MJ/m³. Calculate [8]

- i) The volume of biogas digester
- ii) Power available from the digester

Q5) a) What is a fuel cell? Describe the principle of working of hydrogen - oxygen fuel cell. [8]

b) List the methods of Hydrogen storage. Explain any two. [8]

OR

Q6) a) Classify energy storage systems. Explain pumped hydroelectric storage. [8]

b) Explain the operation of electrochemical cell. List the battery parameters. Explain any four. [8]

Q7) a) What is mean by Time Value of money? Why it should be considered? What is Net Present Value (NPV). [6]

b) Define internal Rate of Return. Explain with an example. [4]

c) A person wants to purchase solar water heating system of Rs.30. 000/- it is required to do a down payment of Rs.5000/-.An annual end of year payment of Rs.3,400/- is required for 10 yrs. But the person paid Rs.3200/- yearly and a balance payment at the end. Determine the value of balance payment if money is worth 10% interest. [8]

OR

Q8) a) Define [6]

- i) Payback period
- ii) Return on investment.

Give the limitations of each.

b) What are different parameters required for synchronization of renewable energy source with grid. [4]

c) A co-generation system installation is expected to reduce the company's annual Energy bill by Rs. 20 Lacs. If the capital cost of new co-generation installation is Rs. 90 Lacs and the annual operating and maintenance cost is Rs. 5 Lacs [8]

- i) What will be the expected payback period for the project?
- ii) What will be the Initial (Simple) Rate of Return/Return on Investment (ROI)?



Total No. of Questions : 9]

SEAT No. :

P3320

[5461]-577

[Total No. of Pages : 2

B.E. (Electrical)
DIGITAL SIGNAL PROCESSING
(2015 Course) (403143D) (Elective - I)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) Give detail classification of discrete time system. [5]

b) Find ‘z’ transform of following sequence with ROC [5]

i) $x(n) = \{1, 2, 3, -1, -2\}$

↑

ii) $x(n) = \delta(n) + \delta(n-1) + 2\delta(n+1)$

OR

Q2) a) Find the inverse z-transform $X(z) = \frac{2 + z^{-2} + 3z^{-4}}{z^2 + 4z + 3}$ for ROC $|z| > 0$ [5]

b) State and prove following properties at DTFT [5]

i) Scaling

ii) Time shifting

Q3) a) State and explain sampling theorem. [5]

b) Determine z-transform including ROC of

$$x(n) = (2)^n [u(n) - u(n-5)]$$

[5]

OR

Q4) a) Define DTFT and IDTFT with its significance. [5]

b) State and prove following properties of DTFT [5]

i) Linearity

ii) Time reversal

P.T.O.

- Q5)** a) Explain 8-point radix 2 DIF FFT algorithm. [8]
 b) Compute 4 point DFT of the sequence [8]

$$x(n) = \begin{cases} \frac{1}{4} & \text{for } 0 \leq n \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

OR

- Q6)** a) Define DFT and IDFT and also give relation between z-transform and DFT. [8]
 b) State and prove following properties of DFT [8]
 i) Periodicity
 ii) Linearity

- Q7)** a) Prove the relation between z-transform and s-transform using bilinear transformation. [8]
 b) Explain design procedure for IIR filter design using butterworth technique. [8]

OR

- Q8)** a) Compare analog and digital filters. [8]
 b) Explain cascade and parallel structure of IIR filter. [8]

- Q9)** Write short note on (any three) [18]
 a) Application of DSP in power factor correction
 b) DSP based protective relay
 c) DSP for measurement of voltage and current
 d) FIR filter design(using rectangular window)



Total No. of Questions : 08]

SEAT No. :

P3321

[Total No. of Pages : 2]

[5461] - 578

B. E. (Electrical)

RESTRUCTURING AND DEREGULATION

(2015 Pattern) (Semester - I) (403144 A) (Elective - II)

Time : 2 $\frac{1}{2}$. Hour]

[Max. Marks : 70

Instructions candidates:

- 1) Answer Q1, or Q2, Q3, or Q4, Q5, or Q6, Q7, or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

- Q1)** a) Why the need of regulation was felt in the power sector? [6]
b) Explain how socio economic aspects are considered in power sector regulation. [6]
c) Elaborate the key indices for assessment of performance of transmission utility. [8]

OR

- Q2)** a) Write down the functions of CERC and SERC in Indian power sector. [8]
b) Explain the various phases of tariff determination. [6]
c) Compare fixed and variable charges as cost components of utilities. [6]

- Q3)** a) How trading of renewable energy credits carried out in energy markets. [8]
b) Briefly explain any two models of ISO. [10]

OR

- Q4)** a) With a neat sketch explain following structural models [8]
i) Monopoly
ii) Single buyer
b) How do the pool and bilateral dispatch models based on contractual arrangement work? What are their key features. [10]

P.T.O.

- Q5)** a) Write short note on [8]
i) Market power
ii) Market efficiency
- b) What do you understand by Market Clearing Price (MCP)? What are the factors affecting MCP. [8]

OR

- Q6)** a) Distinguish between spot market and forward market with examples. [8]
- b) What are the peculiarities of electricity as a commodity? How does it differ than any other commodity? List down the rules that govern the electricity markets. [8]

- Q7)** a) Elaborate on the main components of cost in transmission system? [8]
- b) List down the roles of state load dispatch center and national load dispatch centers. [8]

OR

- Q8)** a) What is congestion in power transmission network? What are the reasons for congestion? [8]
- b) What are various transmission pricing methods? Explain any two in detail. [8]

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Total No. of Questions : 8]

SEAT No. :

P3735

[Total No. of Pages : 2

[5461] - 579

B.E. (Electrical)

ELECTROMAGNETIC FIELDS

(2015 Pattern) (Semester - I) (Elective - II)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q. 4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicates full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Derive the expression for energy stored in an electrostatic field in terms of D & E. What is the energy density? Write the expression for it. [8]
b) Three charged cylindrical sheets are present in free space $\rho = 5$ at $r = 2\text{m}$; $\rho = -2$ at $r = 4\text{m}$ and $\rho = -3$ at $r = 5\text{m}$. Find D at (i) $r = 1\text{m}$ (ii) $r = 3\text{m}$ (iii) $r = 4.5\text{ m}$ (iv) $r = 6\text{m}$ [6]
c) What is operator Del. Explain the operation gradient and divergence. [6]

OR

- Q2)** a) What is Gauss's law. Derive an expression for electric field due to an infinite long straight conductor using Gauss's law. [6]
b) What are the different types of co-ordinate system. Explain how a point expressed in Cartesian coordinate system can be converted into its equivalent spherical coordinate system. [8]
c) Explain what is mean by an electric dipole. Derive the expression for electric field at distant point due to electric dipole. [6]

- Q3)** a) A point charge $Q = -60 \text{ nC}$ is moving with a velocity of $6 \times 10^6 \text{ m/s}$ in the direction specified by unit vector $-0.48\hat{a}_x - 0.6\hat{a}_y + 0.64\hat{a}_z$. Find the magnitude of force on moving charge in the magnetic field

$$\bar{B} = 2\hat{a}_x - 6\hat{a}_y + 5\hat{a}_z \text{ mT.} \quad [8]$$

- b) State and explain Biot — Savart law. Also obtain Biot — Savart law equation in terms of distributed current sources. [8]

P.T.O.

OR

- Q4)** a) Find magnetic field on the axis of circular current loop of radius ‘a’. Specialize the result for the magnetic field at the center of the loop. [8]
- b) Define torque. A rectangular coil of area 10 cm^2 carrying current of 50 A lies on plane $2x + 6y - 3z = 7$ such that the magnetic moment of the coil is directed away from the origin surrounded by a uniform field $0.6 \hat{a}_x + 0.43 \hat{a}_y + 0.5 \hat{a}_z \text{ Wb/m}^2$. Find the torque on the coil. [8]

- Q5)** a) Derive the boundary conditions at an interface between two magnetic media having permeability μ_1 and μ_2 respectively. [8]
- b) A homogeneous dielectric ($\epsilon_r = 2.5$) fills region 1 ($x \leq 0$) while region 2 ($x \geq 0$) is free space. If $D_1 = 12\hat{a}_x - 10\hat{a}_y + 4 \hat{a}_z \text{ nC/m}^2$. Find D_2 and θ_2 [8]
- OR

- Q6)** a) The region I and II interface each other. Region 1 has $\mu_{r1} = 1.5$ and region II has $\mu_{r2} = 1$. ϵ of both regions are equal. The flux density vector $\bar{B}_1 = -1.2\bar{a}x + 0.8\bar{a}y + 0.4\bar{a}z$. Tesla is incident at boundary of I and II from medium I. Compute BII, angle of incidence, angle of refraction and angle of reflection by applying boundary conditions. [8]
- b) Explain the polarization in dielectrics. [8]

- Q7)** a) State Maxwell's equations in point and integral form for time varying fields. [8]
- b) Define displacement current. Derive the modified point form of ampere's law $\nabla \times \bar{H} = J_c + \frac{\partial \bar{D}}{\partial t}$ [10]

OR

- Q8)** a) Derive the expression for emf induced in conductor in motion through the time varying field. [8]
- b) State and prove Poynting theorem. Interpret each term of Poynting theorem. [10]



Total No. of Questions : 08]

SEAT No. :

P3322

[Total No. of Pages : 2]

[5461] - 580

B.E. (Electrical)

EHV AC TRANSMISSION

(2015 Pattern) (End Sem.) (403144C) (Semester-I) (Elective-II)

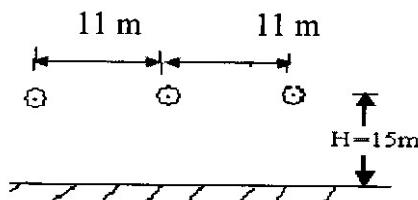
Time : 2 ½ Hours]

[Max. Marks : 70]

Instructions of the candidates:

- 1) Answer all questions.
- 2) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7, or Q8.
- 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.

- Q1)** a) Prove that the percentage power loss in transmission line is independent of line length. [4]
- b) The dimensions of a 3-phase 400-kV horizontal line as shown in fig. are: $H = 15 \text{ m}$, $S = 11 \text{ m}$ phase separation, conductor $2 \times 3.18 \text{ cm}$ diameter, and $B = 45.72 \text{ cm}$. Calculate: the matrix of inductances per km, for un transposed configuration. [8]



- c) Explain Field of sphere gap and also derive equation as $S_1 S_2 = R^2$. [8]

OR

- Q2)** a) Write a note mechanical considerations in line performance. [8]
- b) Derive expression for inductance of multi conductor lines & state Maxwell's coefficients [8]
- c) Explain the field of a point charge and its properties. Derive the equation for the electrostatic field of a point charge. [4]

P.T.O.

- Q3)** a) Evaluate the horizontal, vertical and total value of electrostatic field components near the single circuit transmission line, which are energized by three phase voltages. [10]
- b) Derive expression for electrostatic induction on un energized circuit of double circuit line. [8]

OR

- Q4)** a) Derive the expression for electrostatic field of Double circuit 3 phase A.C line [10]
- b) Discuss effect of high electrostatic field on: [8]
- i) Humans
 - ii) Animals
 - iii) Plants

- Q5)** a) With a simple block diagram, explain the Audible noise measuring circuit in Extra high voltage ac lines. [8]
- b) State and explain at least 4 formulae for power loss due to corona. [8]

OR

- Q6)** a) Explain formation of corona & define terms [8]
- i) Corona inception voltage.
 - ii) Visual corona voltage.
- b) Draw a charge - voltage diagram and derive an expression $P_c = \frac{1}{2} KC (V_m^2 - V_0^2)$ for corona loss. [8]

- Q7)** a) State and explain at least four factors to be considered in the design of ehv lines based upon the steady state limits. Also state their limiting value. [8]
- b) Name the materials used for insulation in E.H.V cables; and state the properties of SF₆ gas as an insulating in cables. [8]

OR

- Q8)** a) Define tan δ loss factor & derive an expression for insulation resistance of a cable. [8]
- b) Write note on various properties of XLPE used in EHV cables. [8]

Total No. of Questions : 08]

SEAT No. :

P3323

[Total No. of Pages : 2]

[5461] - 580 - A

B.E. (Electrical)

ELECTRIC AND HYBRID VEHICLES

(2015 Pattern) (403144D) (Semester - I) (Elective - II)(End Sem)

Time : 2 ½ Hours]

[Max. Marks : 70]

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Which are the various parameters that determines the performance of the vehicle. [6]

b) Explain with the neat diagram working & components of Fuelcell vehicle. [8]

c) What is Battery Management System ? Explain functions of BMS. [6]

OR

Q2) a) Write a short note on Ultra capacitor. [6]

b) What is SoC? Explain any method for estimation of SoC. [6]

c) Which are the different cell balancing methods? Explain any one with diagram. [8]

Q3) a) Energy consumption of Electric Vehicle. [8]

b) Explain various hybrid drive train. [8]

OR

Q4) a) Which are the different challenges for EV design. [8]

b) Explain in detail Tractive Effort of electric vehicle. [8]

P.T.O.

- Q5)** a) Explain GPS tracking of Electric Vehicle. [8]
b) Draw & explain Switch Reluctance Motor. [8]

OR

- Q6)** a) Explain working BLDC motor with diagram. [6]
b) Explain auto parking system. [4]
c) Compare Electric and Hydralic steering. [6]

- Q7)** a) Which are the various PHEV control strategies? Explain any one in detail. [6]
b) Describe control method for EV aggregator for dispatching a fleet of EV. [8]
c) Explain concept of Vehicle to Vehicle. [4]

OR

- Q8)** a) Write short note on Vehicle to Grid. [8]
b) Explain Vehicle to Home. [6]
c) Explain demand response for EV. [4]

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Total No. of Questions : 11]

SEAT No. :

P3736

[Total No. of Pages : 2

[5461] - 580 B
B.E. [Electrical] (Elective - II)
Special Purpose Machines
(2015 Pattern)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer following the questions.*
- 2) *Figures to the right side indicate full marks.*

Q1) Explain the difference between MMFs produced by distributed winding and concentrated winding. [7]

OR

Q2) With usual notations derive the expression for torque from co energy in permanent magnet system.

Q3) Explain sinusoidal type PM synchronous machine [6]

OR

Q4) Explain the concept of electronic commutation.

Q5) Explain constant torque angle control strategy for PMSM. [7]

OR

Q6) Obtain abc - $\alpha\beta$ transformations to get $\alpha\beta$ - dq transformation. State clearly the assumptions made.

Q7) a) Explain constructional features of synchronous reluctance motor with suitable diagrams. [8]

b) Draw and explain phasor diagram of reluctance motor. [8]

OR

Q8) a) With suitable diagram explain radial gap and axial gap reluctance machine. [8]

b) Explain static and dynamic torque production in case of switched reluctance motor. [8]

Q9) a) Explain concept of lead angle. How it is used in control of stepper motor. [9]

b) State applications of stepper motor and selection factors for stepper motor [9]

P.T.O.

OR

- Q10)**a) Explain static characteristics in case of stepper motor. [9]
b) Explain microstepping control of stepper motor. Draw respective block diagram. [9]

Q11) Attempt any two [16]

- a) with suitable diagram explain constructional details of linear induction motor.
- b) Explain any two performance characteristics of linear induction motor.
- c) State and elaborate different applications of linear induction motor.



Total No. of Questions : 10]

SEAT No. :

P3324

[5461]-581

[Total No. of Pages : 2

B. E. (Instru. & Control)
PROCESS DYNAMICS & CONTROL
(2015 Course) (Semester - I) (406261)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain dead time with suitable example. [5]

b) What is non-self regulation? Give its example. [5]

OR

Q2) a) Discuss pole-zero effect on process response. [5]

b) Describe empirical modeling method using PRBS input. [5]

Q3) a) Give analysis of temperature control system. [6]

b) Explain term process gain and process time constant. [4]

OR

Q4) Enlist different control performance measures for common input changes.
Explain use of any one index for performance assessment. [10]

Q5) a) Discuss on concept of feedforward control. [6]

b) With suitable example explicate use of feedforward feedback control system. [10]

OR

Q6) a) Illustrate application of split range controller. [10]

b) Explain concept of inferential control. [6]

P.T.O.

- Q7)** a) Explain interaction and its effect on multivariable processes. [8]
 b) Give details of concept of ideal decoupler design. [10]

OR

- Q8)** Design a decentralized control system for following process

$$G(s) = \begin{bmatrix} \frac{12.8e^{-s}}{16.7s+1} & \frac{-18.9e^{-s}}{21s+1} \\ \frac{6.6e^{-7s}}{10.7s+1} & \frac{-19.4e^{-3s}}{14.4s+1} \end{bmatrix}$$

Derive : [18]

- a) Relative gain matrix
- b) Static decouples
- c) PID Controllers

- Q9)** a) Explain model based controller design procedure for direct synthesis method. [10]
 b) Explain internal model control based PID controller design. [6]

OR

- Q10)** Write a note on (any two) [16]
- a) Internal Model Control.
 - b) Model based control using effect of model uncertainty and disturbance.
 - c) Tuning relations based on smith predictor.



Total No. of Questions : 10]

SEAT No. :

P3325

[Total No. of Pages : 2

[5461] - 582

B.E. (Instrumentation & Control)

PROJECT ENGINEERING AND MANAGEMENT

(2015 Pattern) (406262) (Semester - I)

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) What are the various types of organisation structure? Explain Matrix organisation structure with neat sketch. [10]

OR

Q2) a) What are the various project life cycle phases explain in detail. [6]
b) Write a short notes on Roles and responsibility of Project Manager. [4]

Q3) a) Write the difference between PERT & CPM. [6]

b) Define the following terms [4]

- i) Optimistic time
- ii) Pessimistic time
- iii) Total Float
- iv) Free Float

OR

Q4) a) Explain Work break down structure in details. [5]
b) Write a short notes on milestone scheduling. [5]

P.T.O.

- Q5)** a) Explain Tendering & Bidding process in detail. [8]
b) Explain Procurement activities in the project. [8]

OR

- Q6)** a) Explain vendor documents, drawing and reports as necessary for procurement activity. [8]
b) Draw and explain P&ID for the simple feedback control of heat exchanger. [8]

- Q7)** a) Explain the method of tagging and nomenclature scheme based on ISA standard with suitable examples and symbols. [8]
b) Explain P& ID with a suitable example and summaries the information getting from the same. [8]

OR

- Q8)** a) What are BOM and MBOM? Give its importance. [8]
b) Explain the cable identification scheme, cable trays. [8]

- Q9)** a) What is FAT, SAT & CAT? Write the importance of the same, also prepare the CAT report for any instrumentation item. [9]
b) Explain Cold commissioning and Hot commissioning in detail. [9]

OR

- Q10)** a) Explain guidelines, considerations in design of Control Panel. [9]
b) Explain the FAT for Control Panel. [9]



Total No. of Questions : 10]

SEAT No. :

P3326

[5461]-583

[Total No. of Pages : 2

B.E. (Instrumentation and Control)
COMPUTER TECHNIQUES & APPLICATION
(2015 Pattern) (Semester-I) (406263)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Use of scientific calculator is allowed.
- 3) Figures in the bracket to the right indicate full marks.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Assume suitable data, if necessary.

Q1) a) Assume you have the following processes to execute with one processor, arriving in the order listed below: [5]

Process	Arrival Time	Burst Time
P1	0	7
P2	2	4
P3	4	1
P4	5	4

Draw a Gantt Chart illustrating the execution of these processes using FCFS scheduling. What is the average waiting time and average turnaround time?

b) Explain the difference between logical and physical addresses. [5]

OR

Q2) a) With neat diagram explain Overlays. [5]

b) Explain long term scheduler with respect to Process Scheduling. [5]

Q3) a) Explain any two directory structures in file management system. [5]

b) Explain the following with respect to Networks. [5]

i) WAN

ii) Tree Topology

OR

P.T.O.

- Q4)** a) Write a note on : Demand Paging [5]
b) List the configuration details of GPIB and its advantages. [5]

- Q5)** a) Explain different types of Real time operating systems in detail. [6]
b) State the advantages and disadvantages of data parallelism. [6]
c) Differentiate lossless and lossy data compression. [6]

OR

- Q6)** a) Explain the interrupts in real time operating systems. [6]
b) Explain the concept of intertask dependency in parallel computers. [6]
c) Design a Huffman code for a source that puts out symbols a_1 , a_2 , a_3 , and a_4 with their respective probabilities of occurrence as 0.1, 0.3, 0.2 and 0.4. [6]

- Q7)** a) What is software debugging? Explain any two debugging techniques. [8]
b) Write a note on Software Maintenance. [8]

OR

- Q8)** a) Explain white box and black box testing. Discuss the advantages and limitations of each. [8]
b) Write a note on Intergrated Testing. [8]

- Q9)** a) Explain component based software analysis in detail. [8]
b) Explain the processes involved in software development Life cycle. [8]

OR

- Q10)** a) Explain the incremental model in Software Development Life cycle. [8]
b) Explain the steps in software design. [8]



Total No. of Questions : 10]

SEAT No. :

P4229

[Total No. of Pages : 2

[5461]-584

B.E. (Instrumentation)

INDUSTRIAL INTERNET OF THINGS

(2015 Pattern) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, electronic pocket calculator and steam table is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) Explain usage View point in architecture of IIOT. [7]

b) If IP address is 172.20.255.75 and subnet mask is 255.255.255.20 compute how many host are on network. [3]

OR

Q2) Discuss various types of platform used in IIOT. [10]

Q3) a) Explain 6LoWPAN with it's architecture. [6]

b) State industrial revolutions and kind of revolution in each. [4]

OR

Q4) a) Explain importance of identity management in IIOT. [6]

b) Which are capabilities must be fulfill by any device to works as 'thing' in IIOT. [4]

Q5) a) Explain cloud computing in brief. [8]

b) Explain Identity management model in brief. [8]

OR

P.T.O.

Q6) a) Explain clustering in IIOT. [8]

b) Explain roll of software agent in IIOT. [8]

Q7) a) Explain importance of security management in IOT. [8]

b) Explain contributions from FP7 projects to IOT in brief. [8]

OR

Q8) a) What is data aggregation? Explain it's application in IOT. [8]

b) Explain Vulnerabilities of IOT. [8]

Q9) a) Explain application of IOT in Home Automation. [9]

b) Explain application of IOT in security. [9]

OR

Q10)a) How IOT can be employed to maintain infrastructure of any industry.[9]

b) Explain interfacing of Sensors and actuators with any embedded target board. [9]



Total No. of Questions : 12]

SEAT No. :

P4230

[Total No. of Pages : 2

[5461]-585

B.E. (Instrumentation and Control) (Semester - I)
ELECTRICAL DRIVES
(2015 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) Explain basic blocks in drive system with a block diagram? [6]

OR

Q2) Explain Solid state control of drive? [6]

Q3) What do you understand by speed control and torque control of drive. Explain with example? [8]

OR

Q4) Draw and explain the load quadrantal diagram w.r.t. speed and torque? [8]

Q5) Explain the various converters with waveform. [6]

- i) Buck
- ii) Buck Boost

OR

Q6) Define PWM. How is the drive controlled using this technique with waveform? [6]

P.T.O.

Q7) a) Draw and explain speed-torque characteristics of DC shunt and DC series motor? [8]

b) Write short note on quick commissioning of DC drive with parameters? [8]

OR

Q8) a) Enlist and explain the various speed and torque control methods of DC Motors? [8]

b) Explain the block diagram of DC drive? [8]

Q9) a) What is the relation between slip and torque with equation. [8]

b) Explain vector control with sensor and without sensor? [10]

OR

Q10)a) Explain speed torque characteristics of induction motor? [9]

b) How to select a drive for different applications? List all the considerations? [9]

Q11)a) What is servo control? Explain with diagram speed and position control methods of servo drive? [8]

b) write a short note on traction drives? [8]

OR

Q12)a) How to configure a siemens AC drive? [8]

b) Write a short note on battery and solar powered drive with example? [8]



Total No. of Questions : 10]

SEAT No. :

P4231

[Total No. of Pages : 2

[5461]-587

B.E. (Instrumentation and Control)

**ADVANCED BIOMEDICAL INSTRUMENTATION
(2015 Course) (Semester - I)**

Time : 2½ Hours]

[Max. Marks : 70

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 various applications of biotelemetry. [5]
b) Brief out about an Auto analyse. [5]

OR

- Q2)** a) What is radionuclide imaging? Explain how it is advantageous than other mode of imaging? [5]
b) Explain the acoustic impedance with respect to Ultrasound imaging. [5]

- Q3)** a) What are the drawbacks of X-Ray imaging? Explain the way its overcomes. [6]
b) Justify with technical reason, why Tungsten is used as a target material of anode in X - ray tube? [4]

OR

- Q4)** a) Elaborate on Hounsfield no. (CT number) in CT scan. [5]
b) Discuss various methods of image reconstruction in CT scanning. [5]

- Q5)** a) What is heart lung machine? Explain it with its components? Explain why natural lungs are also by pass during open heart surgery? [10]
b) What is fibrillation state of heart? What is defibrillator? Why D.C. Defibrillator are preferred over AC defibrillator? [8]

P.T.O.

OR

Q6) a) What is a pacemaker? List out basic three types of pacemaker. Explain implanted pacemaker in detail. [10]

b) Explain various modes of ESU? Justify why active electrode is pointed tip type and passive electrode (patient plate) should have large area. [8]

Q7) a) Explain different applications of LASER in the field of Dermatology. [8]

b) What is an endoscope? Enlist various types of endoscopes based on their use with particular organ. [8]

OR

Q8) a) Explain thermal and non thermal interaction of tissue with LASER. [10]

b) Explain high frequency heat therapy concept. How it is advantageous over the conventional heat therapy? [6]

Q9) a) Differentiate between orthosis and prosthesis concepts used in rehabilitation engineering. Brief out Main types of wheel design related with wheel chair. [8]

b) Explain four critical performance factors in wheel design to optimize interaction of wheel with ground. [8]

OR

Q10)a) Draw and explain the structure of nephron and explain the process of regulation of water and electrolyte balance. [8]

b) Explain the principle of dialyser used for hemodialysis. Brief out the types of dialysers. [8]



Total No. of Questions : 10]

SEAT No. :

P3327

[5461]-588

[Total No. of Pages : 3

B.E. (Instrumentation & Control Engineering)

DIGITAL CONTROL SYSTEMS

(2015 Course) (Semester - I) (End Sem.) (Elective - I) (406264E)

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) *Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of calculators is allowed.*

Q1) a) State Sampling Theorem. [2]

b) List salient features of Deadbeat Controller and explain the drawbacks of Deadbeat Controller. [8]

OR

Q2) Derive mathematical model of Zero Order Hold. [10]

Q3) By using Bilinear Transformation check the stability of following characteristics equation [10]

$$P(Z) = Z^3 - 4Z^2 + 5Z - 2 = 0$$

OR

Q4) Derive the Pulse Transfer Function of Velocity form of Digital PID Controller and show the block diagram representation of Velocity form of Digital PID controller. [10]

Q5) a) Obtain State Transition Matrix $\Psi(K)$, the State $X(K)$ and Output $Y(K)$, when I/P $U(K) = 1$ for the following discrete time control system. [10]

$$G(Z) = \frac{0.1}{Z-1} + \frac{-0.1}{Z-0.8197} \quad \text{Where, } X(0) = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

b) Derive equation to find out Pulse Transfer Function form a State Model. [6]

OR

P.T.O.

Q6) a) A system is described by a State Model given below [8]

$$\begin{bmatrix} X_1(K+1) \\ X_2(K+2) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} X_1(K) \\ X_2(K) \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} U(K)$$

$$Y(K) = [1 \ 2] X(K)$$

Obtain State Model in Jordon Canonical Form.

b) Check the State Controllability and State Observability of the following system. [8]

$$X(K+1) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -40 & -34 & -10 \end{bmatrix} X(K) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} U(K)$$

$$Y(K) = [1 \ 0 \ 0] X(K)$$

Q7) a) Explain the term Observer. List types of observers and explain each type in short. [8]

b) Check Observability of the following system [8]

$$PTF = \frac{Z^{-1}(1 + 0.8Z^{-1})}{1 + 1.3Z^{-1} + 0.4Z^{-2}}$$

OR

Q8) a) Determine State Feedback Gain Matrix K for the following system. [8]

$$X(K+1) = G X(K) + H U(K)$$

$$Y(K) = C X(K)$$

$$\text{Where, } G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix} \quad H = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

That will place the system poles at $Z_1 = 0.5 + j 0.5$ & $Z_2 = 0.5 - j 0.5$

b) Find Pulse Transfer Function for the system below [8]

$$\begin{bmatrix} X_1(K+1) \\ X_2(K+2) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix} \begin{bmatrix} X_1(K) \\ X_2(K) \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} U(K)$$

$$Y(K) = [1 \ 0] X(K)$$

Q9) For a linear discrete time system is having the State Equation as

[18]

$$X(K+1) = 0.4135 X(K) + 0.6321 U(K)$$

The performance index is given by :

$$J = \frac{1}{2} X^2(8) + \frac{1}{2} \sum_{K=0}^7 [X^2(K) + U^2(K)]$$

Find Control Law and Minimum Performance Index J_{\min}

OR

Q10) For a linear discrete time system is having the State Equation as

[18]

$$X(K+1) = G X(K) + H U(K)$$

$$G = \begin{bmatrix} 0 & 1 \\ -1 & 1 \end{bmatrix}; H = \begin{bmatrix} 0 \\ 1 \end{bmatrix}; X(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}; Q = S = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}; R = 1$$

The performance index is given by :

$$J = \frac{1}{2} X^2(5) + \frac{1}{2} \sum_{K=0}^4 [X^2(K) + U^2(K)]$$

Find Control Law and Minimum Performance Index J_{\min}



[5461] - 589

B.E. (Instrumentation and Control) (Semester - I)
SMART AND WIRELESS INSTRUMENTATION
(2015 Pattern)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicates full marks.*
- 3) *Assume suitable data; if necessary.*

Q1) Explain advantages and disadvantages of multi-hop communications in terms of performance, reliability and security. [6]

OR

Q2) Explain with neat diagram wireless sensor network. [6]

Q3) Explain IMote node architecture in detail. [6]

OR

Q4) Explain field programmable array (FPGA) in detail. [6]

Q5) Explain with neat diagram explain components of digital communication system. [8]

OR

Q6) Explain different types of channels in detail of channel encoding. [8]

Q7) Home automation system is to be design using WSN and Zigbee communication. Discuss the system based on following points.

- a) Block Diagram. [5]
- b) Sensor Selection. [5]
- c) Detail explanation of the system. [6]

OR

Q8) a) Explain wireless communication topologies. [8]
b) Explain in detail Zigbee super frame structure. [8]

Q9) a) What are different techniques of energy harvesting? Explain thermal energy harvesting Technique in detail. [8]
b) Explain with neat diagram operation of battery system. [8]

P.T.O.

OR

- Q10)**a) Explain with neat block diagram R-F energy harvesting. [8]
b) Write short notes on,
 i) Mechanical Energy Harvesting. [4]
 ii) Criteria for battery selection. [4]

- Q11)**a) Explain motivation of structural health monitoring. Also explain global and local inspection techniques in detail. [9]

- b) Write short note on precision agriculture. [9]

OR

- Q12)**a) Explain inductive loop in traffic light control. [9]

- b) Explain the processing components of the artificial retina in detail with suitable diagram. [9]



Total No. of Questions : 10]

SEAT No. :

P3328

[Total No. of Pages : 2]

[5461] - 590

B.E. (Instrumentation & Control)

INSTRUMENTATION & CONTROL FOR POWER PLANTS

(2015 Pattern) (Semester-I) (Elective-II)(End Sem.)

Time : 2 ½ Hours]

[Max. Marks : 70]

Instructions of the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7, or Q8, or Q9, or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Draw and Explain Steam temperature control loop in a boiler. [5]
b) Explain in detail the Demineralization water treatment plant in a thermal power plant. [5]

OR

- Q2)** a) Explain the working of electrostatic precipitator. [6]
b) Suggest suitable transducers for measurement of Boiler drum level. [4]

- Q3)** a) Explain any two functions of Electro-hydraulic governor. [5]
b) Explain with a neat sketch speed control system used in turbine. [5]

OR

- Q4)** a) Write a short note on hydrogen cooling system. [5]
b) Explain the working of O₂ analyzer using Zirconium oxygen probe for flue gas analysis. [5]

- Q5)** a) List various types of nuclear reactors and explain any one type. [8]
b) State the safety objectives of Indian Nuclear Power Plants. [8]

OR

P.T.O.

- Q6)** a) Write a short note on Radioactive waste management. [8]
b) With the help of a neat diagram explain the working of nuclear power plant. [8]

- Q7)** a) What do you understand by Dosimeter? Explain the working of pocket dosimeter. [9]
b) Explain the thermal energy control loop for Pressurized water nuclear reactor. [9]

OR

- Q8)** a) Explain different safety practices followed in a nuclear power plant. [9]
b) Draw a control loop for steam flow control in boiler water nuclear reactor [9]

- Q9)** a) Explain with a neat sketch the operation of governing of Francis turbine. [8]
b) What safety measures need to be taken for safe operation of hydroelectric power plant. [8]

OR

- Q10)** a) State the advantages of using SCADA in Power plants. [8]
b) List different energy management techniques and explain any one. [8]

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Total No. of Questions : 10]

SEAT No. :

P3329

[Total No. of Pages : 2]

[5461] - 590 -A

B.E. (Instrumentation & control) (Semester-I)

AUTOMOTIVE INSTRUMENTATION

(2015 Pattern) (End sem) (406265C) (Elective-II)

Time : 2 ½ Hours

[Max. Marks : 70]

Instructions of the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7, or Q8, or Q9, or Q10.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) What are the various methods of charging an automobile battery? Explain any one. [5]

b) With neat diagram, explain the lightning system in automobiles. [5]

OR

Q2) a) Describe the contactless Ignition control system used in automobiles? [6]

b) Describe the exhaust emission control system and its necessity in automobiles? [4]

Q3) Enlist the different Sensors used in automobiles? Explain any two in details? [10]

OR

Q4) a) Describe the idle speed control system used in automobile? [5]

b) Describe the operation and working principle of vehicle speed sensor? [5]

Q5) a) Describe the functional block diagram, control functions of electronic Stability Program (ESP) in traction and stability control of vehicle. [10]

b) Describe the concept of electronic steering control theory in automobiles? [8]

OR

P.T.O.

Q6) a) Describe the importance, Operating Principle and the provision of ABS in automobiles? [10]

b) Describe the cruise control system in vehicle? [8]

Q7) a) Describe the fully automated temperature control system and its block diagram in HVAC System. [8]

b) Describe the electronically controlled doors and windows system in automobiles? [8]

OR

Q8) a) Describe the design details of central locking and antitheft system in automobiles? [8]

b) Describe the RPAS (Reverse Park Assist System) in automobiles? [8]

Q9) a) Elaborate how Electric vehicles has helped in reducing pollution & helping society? [8]

b) Describe the concept of hybrid technology mentioning its advantages & disadvantages. Used in automobiles? [8]

OR

Q10)a) Describe the concept of Electric vehicles? Give advantages and disadvantages? [8]

b) Explain the automatic driver assist system used in automobiles? [8]

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Total No. of Questions : 10]

SEAT No. :

P3330

[Total No. of Pages : 2

[5461] - 590-B

B.E. (Instrumentation & Control)

OPTO-ELECTRONICS INSTRUMENTATION

(2015 Course) (Elective - II) (Semester - I) (End Sem.)

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10.
- 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 advantages of Fiber Optic Cable. [5]

b) Compare Optical Connectors and Splices. [5]

OR

Q2) a) Determine the numerical aperture and acceptance angle for a optical fiber having refractive indices of core and cladding regions as 1.5 and 1.49 respectively. [5]

b) List out methods for Manufacturing of optical fiber. With neat sketch elaborate any one. [5]

Q3) a) Discuss the pressure measurement using optical fiber. [5]

b) Explain in detail optical link power budget? [5]

OR

Q4) a) Elaborate losses in fiber optic cable. [5]

b) Explain with diagram application of optical fiber for displacement measurement. [5]

P.T.O.

Q5) a) List out the types of LASERS. Explain construction and working of any one. [8]

b) Explain the Holography with suitable application. [8]

OR

Q6) a) Explain with neat sketch, LASER interferometry. List the applications of LASER interferometry. [8]

b) Describe the LASER with respect to following points: [8]
i) Properties of laser
ii) Laser modes

Q7) a) What are the analog arithmetic operations in optics? Explain all operations in detail. [8]

b) Explain in short: Integrated Optical Devices. [8]
i) Switches
ii) Modulators.

OR

Q8) a) List out the integrated optical devices. Explain Beam splitter in detail. [8]

b) What is Optical Amplifier? Explain the need of Optical Amplifier in optics. [8]

Q9) a) Explain with block diagram Optical Power Meter. [9]

b) With a neat diagram describe the working of Optical Spectrum analyzer. [9]

OR

Q10) a) Explain with block diagram Optical Time Domain Refractrometer (OTDR). [9]

a) Explain with block diagram working principle of Fiber Optical Numerical Aperture Measurement. [9]



Total No. of Questions : 8]

SEAT No. :

P3331

[5461]-591

[Total No. of Pages : 2

B. E. (Computer Engineering)
HIGH PERFORMANCE COMPUTING
(2015 Pattern) (Semester - I) (410241)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) State and explain basic working principle of Super Scalar Processors. [6]
b) Explain basic working of VLIW Processor. [6]
c) Elaborate four subclasses of the Parallel Random Access Machine (PRAM). [8]

OR

- Q2)** a) Differentiate Static and Dynamic mapping techniques for load balancing. [6]
b) Write a short note on All-to-one reduction with suitable example. [6]
c) Explain any four methods for containing interaction overheads. [8]

- Q3)** a) Explain Parallel Matrix-Vector Multiplication algorithm with example. [8]
b) Explain the Performance Metrics for Parallel Systems. [8]

OR

- Q4)** a) Explain Parallel Matrix-Matrix Multiplication algorithm with an example. [8]
b) Interpret the effect of Granularity on Performance of parallel execution. [8]

- Q5)** a) Compare an algorithm for sequential and parallel Merge sort. Analyze the complexity for the same. [8]
b) Modify Depth First Search for parallel execution and analyze its complexity. [8]

OR

P.T.O.

Q6) a) Discuss the issues in sorting for parallel computers. [8]

b) Explain Dijkstras shortest path algorithm. [8]

Q7) a) Explain parallelism in Best First Search algorithm. Give an appropriate example. [8]

b) Design a simple CUDA kernel function to multiply two integers. [6]

c) List APIs for dealing with CUDA device memory. [4]

OR

Q8) a) Describe CUDA Architecture in details with neat diagram. [8]

b) Write advantages and limitations of CUDA. [5]

c) Give five applications of CUDA. [5]



Total No. of Questions : 10]

SEAT No. :

P3332

[Total No. of Pages : 2

[5461] - 592

B.E. (Computer Engineering)

ARTIFICIAL INTELLIGENCE AND ROBOTICS

(2015 Pattern) (Semester - I) (410242) (End Sem.)

Time : 2½ Hours]

/Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, and Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Justify your answer with an example wherever necessary.

Q1) a) Explain iterative deepening depth first search (IDF) and justify its parameters based on time complexity, space complexity. [6]

b) Differentiate between uninformed and informed search methods. [6]

OR

Q2) a) Apply crypt-arithmetic to solve the problem and represent the state search space to solve. TWO + TWO = FOUR. [6]

b) Explain Hill climbing algorithm. Explain Local maxima, Global Maxima and Plateau for an example. [6]

Q3) a) Represent the following sentences into formulas in predicate logic, [6]

- i) John likes all kinds of food.
- ii) Apples are food.
- iii) Chicken are food.
- iv) Anything anyone eats and isn't killed by is food.
- v) Bill eats peanuts and is still alive.
- vi) Sue eats everything Bill eats.

b) Explain the components of a planning system for a simple Blocks World example. [6]

OR

P.T.O.

- Q4)** a) Explain forward chaining and backward chaining for a simple example. [6]
b) Explain different Facets of Knowledge with examples. [6]

- Q5)** a) Explain in detail all the phases of Natural Language Processing (NLP). [6]
b) Explain supervised and unsupervised learning with an example. [6]
c) Write a short note on Radar. [6]

OR

- Q6)** a) Explain the Bug2 algorithm for path planning for a point robot. [6]
b) Explain the architecture of Artificial Neural Network. [6]
c) Explain simultaneous localization and mapping (SLAM) for a point robot. [6]

- Q7)** a) Explain the architecture of information retrieval system. [6]
b) Compare the various weighting functions used in pose estimation. [4]
c) Explain the inertial sensors - accelerometers and gyroscopes. [4]

OR

- Q8)** a) Comment on the fundamental problems in Robotics. [6]
b) Explain the applications of Natural Language Processing. [4]
c) Comment on how robotics can be used to design intelligent vehicles. [4]

- Q9)** a) Comment on the importance of mapping and the layers of map data. [6]
b) Explain horizontal decomposition used in the design of many autonomous robot systems. [4]
c) With the help of an architecture diagram explain multilayer feed forward artificial neural network. [4]

OR

- Q10)** a) Comment on any two robots used in practice. [6]
b) Comment on problem regarding natural language processing (NLP) in information retrieval (IR). [4]
c) Explain in brief infrared sensors. [4]



Total No. of Questions : 8]

SEAT No. :

P3333

[Total No. of Pages : 2

[5461]-593

**B.E. (Computer Engineering)
DATAANALYTICS
(2015 Pattern) (Semester-I) 410243**

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data if necessary.

- Q1)** a) Explain Data Analytic Life cycle. [8]
b) When do we use Wilcoxon rank-sum test? Write steps in the test. [6]
c) Explain linear regression with example. [6]

OR

- Q2)** a) Compare BI Vs.Data science. [6]
b) Explain k-means clustering algorithm.What are its drawbacks? [7]
c) Explain Apriori association rule mining algorithm. [7]

- Q3)** a) Explain Bayes ‘theorem.Explain Naive Bayes’ classifier. [8]
b) Explain any three of classification performance measures. [6]
c) What is classification? List the different classifiers. [3]

OR

- Q4)** a) What is decision tree? Explain how decision tree is constructed using ID3 algorithm. [8]
b) Explain the following: [3]
i) Conditional probability.
ii) Posterior probability.
c) Explain the following with their significance: [6]
i) Entropy
ii) Information gain
iii) Gain ratio

P.T.O.

Q5) a) What is data visualization? Explain any four data visualization Techniques [9]

b) What are the challenges in Big data visualization? [8]

OR

Q6) a) Explain how data visualization is done or visually represented, if data is 1-D, if data 2-D and data is 3-Dimensional? [6]

b) Explain Big data visualization tools in short (any four tools). [8]

c) Explain analytical techniques used in Big data visualization. [3]

Q7) a) Explain use cases for analytics for unstructured data. [5]

b) Explain MapReduce paradigm with example. [6]

c) Explain Hadoop Distributed File System. [5]

OR

Q8) a) Explain the Hadoop Ecosystem in detail with Pig, Hive, HBase and Mahout. [8]

b) Give a brief review of the key outputs for each of the main any four stakeholders of an analytics project. [4]

c) What are four major categories of NOSQL Tools (stores)? [4]



Total No. of Questions : 10]

SEAT No. :

P3334

[5461]-594

[Total No. of Pages : 2

B.E. (Computer Engg.)

DIGITAL SIGNAL PROCESSING

(2015 Course) (Semester - I) (Elective - I) (410244A)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve any Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Figures to the right indicate full marks.*
- 3) *Choose suitable data wherever required.*

- Q1)** a) Explain the process of ADC with basic block diagram? [8]
b) Test the following system for causality, linearity and stability? [6]

$$Y(n) = x(-n + 2)$$

OR

- Q2)** a) Explain various operations on the basic signal, properties and types of signal? [8]
b) Obtain DTFT and sketch the magnitude spectrum for [6]

$$x(n) = u(n) - u(n - 3)$$

- Q3)** a) Obtain Linear Convolution for the sequence of $x(n) = \{1, -2, 3, 1\}$ and $h(n) = \{4, 3, -2\}$? [8]
b) Explain various methods of Circular Convolution in detail? [6]

OR

- Q4)** a) Explain the procedure of obtain LC using CC method? Explain with suitable example? [8]
b) Obtain Circular Convolution for the sequence of $x(n) = \{2, 4, 3, 2\}$ and $h(n) = \{1, 4, 3, 2\}$? [6]

- Q5)** a) Find the 8-pt DFT using Radix-2 DIT FFT algorithm for the given sequence $x(n) = \{-1, 0, 2, 0, -4, 0, 2, 0\}$ [8]
b) Obtain the twiddle factor matrix for $N = 8$? Also explain the properties of Twiddle Factor? [6]

OR

P.T.O.

- Q6)** a) Enlist the Properties of ZT? Also explain the various ROC for Single/
Both sided sequence? [8]
- b) Explain various methods of obtaining the IZT? [Hint : PFE] [6]

- Q7)** a) Explain various properties of LTI system? Enlist types of LTI systems? [10]
- b) Explain the N-th order general difference equation in brief? [4]

OR

- Q8)** a) Obtain the ROC for the causal system with DE as follows [8]

$$Y(n) = 0.5Y(n-1) - 0.25Y(n-2) + x(n)$$

- b) Explain the method to determine the system characterized by [6]

$$H(Z) = (3 - 4Z^{-1})/(1 - 3Z^{-1} + 2Z^{-2})$$

is causal, Stable and non-causal?

- Q9)** a) Explain, why IIM is not preferred in the design of IIR filter other than LPF? [6]
- b) Explain in brief the ADSP 21XX DSP processor with block diagram? [8]

OR

- Q10)** a) Explain the Direct Form - I realization method? Enlist the drawbacks of this structure? [6]
- b) Obtain the Direct Form - I and Form - II realization structure for the following function [8]

$$Y(n) - 3Y(n-1) + Y(n-2) = X(n) + 5x(n-1) - 2x(n-2)$$



Total No. of Questions : 10]

SEAT No. :

P3335

[5461]-595

[Total No. of Pages : 2

B.E. (Computer Engg.)

SOFTWARE ARCHITECTURE AND DESIGN

(2015 Pattern) (Semester - I) (End Sem.) (Elective - I) (410244B)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.

Q1) a) Software Architecture is important in designing software. Explain? [5]

b) What makes “Good” Architecture? [5]

OR

Q2) a) Define quality attributes. What are different system quality attributes. [5]

b) Explain performance tactics in detail. [5]

Q3) a) State significance of tactics. How are quality attribute achieved in software design? [5]

b) Discuss the scenario of availability tactics for Air Traffic Control. [5]

OR

Q4) a) Elaborate on the catalog of design patterns. [5]

b) How Design patterns solve design problems? Explain giving example. [5]

Q5) a) What do you mean by Abstract Factory design pattern? Explain its importance. [8]

b) Identify a case study and apply Singleton pattern design pattern on it. [8]

OR

Q6) a) What do you mean by Facade design pattern? Explain its importance. [8]

b) Identify a case study and apply Adapter design pattern on it. [8]

P.T.O.

Q7) a) Discuss N-tier Web Architecture with a case study. [8]

b) Create one XML document. Compare and contrast XML with JSON? [8]

OR

Q8) a) Show the Life cycle of Java Applet with neat diagram. [8]

b) Write XML DTD and XML Schema structure for a Hotel management XML. [8]

Q9) a) What do you understand by Middleware Technologies? Give the importance of Server Side Technology: MVC [9]

b) Show the architecture for Java EE Technologies: [9]

i) JMS

ii) JDBC

OR

Q10) a) Server Side Technologies are used in multi-tier architectures. Elaborate. Give the use of Server Side Technology: Struts [9]

b) Explain EJB 3.0 Architecture. Explain Message Beans with example. [9]



Total No. of Questions : 10]

SEAT No. :

P3336

[5461]-596

[Total No. of Pages : 2

B.E. (Computer Engg.)

PERVASIVE & UBIQUITOUS COMPUTING

(2015 Course) (Semester - I) (End Sem.) (Elective - I) (410244(C))

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) What is Pervasive Computing? Describe any two applications of Pervasive Computing. [6]

b) Explain context aware applications and steps to develop them. [4]

OR

Q2) a) Draw and explain the SyncML framework for data synchronization. [6]

b) What is ambient service? Explain the concept of ambient service in detail. [4]

Q3) a) Describe the architecture of WAP. What are the advantages and disadvantages of WAP? [6]

b) Explain the two classes of cryptographic algorithms. [4]

OR

Q4) a) Draw and explain speech recognition techniques and its challenges. [6]

b) Write short note on Java Speech API and its components. [4]

Q5) a) What is Servlet? Write a program to access a bean holding consumer data to print out the first and last name of a consumer using JSP. [8]

b) With a neat diagram explain the architecture of J2EE application model. [8]

OR

P.T.O.

- Q6)** a) Explain SOAP web services and its parts. What are the steps to creating and using web services? [8]
- b) Is JSP too inflexible for web applications? Justify. Explain the pattern which is used to overcome the problem for separation of responsibilities? [8]

- Q7)** a) What is user interfaces? How it becomes intelligent? [5]
- b) Explain star model for user-centered design with suitable diagram. [6]
- c) Explain various security issues while designing user interfaces. [6]

OR

- Q8)** a) What is smart card? Write it's applications. [5]
- b) What are the five application areas where we felt that Touche could have the largest impact? [6]
- c) What are the different wearable input output devices? Explain with examples. [6]

- Q9)** a) Explain different searching methods for location data with examples. [7]
- b) What is augmented reality? Where is augmented reality being used? What are the applications of augmented reality with illustration of each? [10]

OR

- Q10)** a) Define Context? Comment on Context Awareness? [7]
- b) Explain how to develop, deploy and evaluate the pervasive computing applications. [10]



Total No. of Questions : 8]

SEAT No. :

P3337

[5461]-597

[Total No. of Pages : 3

B.E. (Computer Engineering)
DATA MINING AND WAREHOUSING
(2015 Course) (Semester - I) (End Sem.) (410244D)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Assume suitable data if necessary.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.

- Q1)** a) For the given attribute AGE values : 16, 16, 180, 4, 12, 24, 26, 28, apply following Binning technique for smoothing the noise. [6]
- i) Bin Medians
 - ii) Bin Boundaries
 - iii) Bin Means
- b) Differentiate between Star schema and Snowflake schema. [6]
- c) Calculate the Jaccard coefficient between Ram and Hari assuming that all binary attributes are symmetric and for each pair values for an attribute, first one is more frequent than the second. [8]

Object	Gender	Food	Caste	Education	Hobby	Job
Hari	M(1)	V(1)	M(0)	L(1)	C(0)	N(0)
Ram	M(1)	N(0)	M(0)	I(0)	T(1)	N(0)
Tomi	F(0)	N(0)	H(1)	L(1)	C(0)	Y(1)

OR

- Q2)** a) Explain following attribute types with example. [6]
- i) Ordinal
 - ii) Binary
 - iii) Nominal
- b) Differentiate between OLTP and OLAP with example. [6]

P.T.O.

- c) Calculate the Euclidean distance matrix for given Data points. [8]

point	x	y
p1	0	2
p2	2	0
p3	3	1
p4	5	1

- Q3)** a) A database has 6 transactions. Let minimum support = 60% and Minimum confidence = 70% [8]

Transaction ID	Items Bought
T1	{A, B, C, E}
T2	{A, C, D, E}
T3	{B, C, E}
T4	{A, C, D, E}
T5	{C, D, E}
T6	{A, D, E}

- i) Find Closed frequent Itemsets
 - ii) Find Maximal frequent itemsets
 - iii) Design FP Tree using FP growth algorithm
- b) Explain with example Multi level and Constraint based association Rule mining. [5]
- c) How can we improve the efficiency of a-priori algorithm. [4]

OR

- Q4)** a) Consider the Market basket transactions shown below. Assuming the minimum support = 50% and Minimum confidence = 80% [8]

- i) Find all frequent item sets using Apriori algorithm
- ii) Find all association rules using Apriori algorithm

Transaction ID	Items Bought
T1	{Mango, Apple, Banana, Dates}
T2	{Apple, Dates, Coconut, Banana, Fig}
T3	{Apple, Coconut, Banana, Fig}
T4	{Apple, Banana, Dates}

- b) Explain FP growth algorithm with example. [5]
- c) Explain following measures used in association Rule mining [4]
- i) Minimum Support
 - ii) Minimum Confidence
 - iii) Support
 - iv) Confidence

- Q5)** a) Explain the training and testing phase using Decision Tree in detail. Support your answer with relevant example. [8]
 b) Apply KNN algorithm to find class of new tissue paper ($X_1 = 3$, $X_2 = 7$). Assume $K = 3$ [5]

X_1 = Acid Durability (secs) X_2 = Strength(kg/sq.meter) Y = Classification

7	7	Bad
7	4	Bad
3	4	Good
1	4	Good

- c) Explain the use of regression model in prediction of real estate prices. [4]

OR

- Q6)** a) What is Bayesian Belief Network. Elaborate the training process of a Bayesian Belief Network with suitable example. [8]
 b) Explain K-nearest neighbor classifier algorithm with suitable application. [5]
 c) Elaborate on Associative Classification with appropriate applications. [4]

- Q7)** a) Discuss the Sequential Covering algorithm in detail. [8]
 b) Explain following measures for evaluating classifier accuracy [4]
 i) Specificity
 ii) Sensitivity
 c) Differentiate between Wholistic learning and Multi perspective learning. [4]

OR

- Q8)** a) How is the performance of Classifiers algorithms evaluated. Discuss in detail. [8]
 b) Discuss Reinforcement learning relevance and its applications in real time environment. [4]
 c) Explain following measures for evaluating classifier accuracy [4]
 i) Recall
 ii) Precision



Total No. of Questions : 10]

SEAT No. :

P3338

[Total No. of Pages : 2

[5461] - 598

B.E. (Computer Engineering)

DISTRIBUTED SYSTEMS

(2015 Pattern) (End Sem.) (Semester - I) (410245 A) (Elective - II)

Time : 2½ Hours]

/Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, and Q9 or Q10.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain what is middleware and its need in distributed system. [5]
b) Explain the openness of distributed system in detail. [5]

OR

- Q2)** a) Explain the uses of RMI mechanism for inter-process communication in distributed system. [5]
b) What is vector clock? How vector clock can be implemented in brief. [5]

- Q3)** a) Explain the following terms. [6]
i) Drift rate
ii) Clock skew
iii) Resynchronization interval
b) Explain in detail ring algorithm. [4]

OR

- Q4)** a) What is global state of distributed system with example? [5]
b) Write short note on detection of communication deadlock. [5]

P.T.O.

- Q5)** a) What is distributed consensus? Explain the consensus in asynchronous system. [8]
b) What is failure detector? Explain the basic properties of failure detector. [8]

OR

- Q6)** a) Explain different methods to recover from the failure. [8]
b) Explain the requirements of atomic commitment problem. How atomic commit protocol can be implemented by two phase commit? [8]

- Q7)** a) Write a short note on IP multicast. [6]
b) What is ordered multicast? Explain any two types. [6]
c) Write a short note on open groups for group communication. [6]

OR

- Q8)** a) Explain data centric strict consistency model. [6]
b) Explain with example quorum based protocol. [6]
c) Explain in brief Brewer's CAP algorithm. [6]

- Q9)** a) Explain in detail challenges for distributed simulation. [8]
b) Explain the different types of attacks possible in distributed system. [8]

OR

- Q10)** a) What are major requirements in security? Explain the mechanisms used to meet security requirements. [8]
a) Explain what is peer-to-peer network with suitable examples. [8]



Total No. of Questions : 12]

SEAT No. :

P3339

[Total No. of Pages : 2

[5461] - 599

B.E. (Computer Engg.)

**SOFTWARE TESTING AND QUALITY ASSURANCE
(2015 Course) (End Sem.) (Semester - I) (Elective - IV)**

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) Assume Suitable Data if necessary. Mention your assumptions.
- 2) Right indicates the full marks and Bifurcation for sub questions.
- 3) Draw suitable diagrams and tables if necessary.

- Q1)** a) What is bug; defect, error & failure give an example of each? [6=3+3]
b) Differentiate between software testing tools and techniques.

OR

- Q2)** a) What is impact of defect in different phases of software development? [6=3+3]
b) What is bug tracking, bug fixing & bug verification.

- Q3)** a) What is mutation testing? Give an example. [7=3+4]
b) Why independent testing team is required in organizations?

OR

- Q4)** a) What are the skill set required by software tester? [7=3+4]
b) With the suitable sample, explain requirement traceability matrix.

- Q5)** a) What are the selection criteria of automated testing tool? [7=3+4]
b) What are the difference in testing automation in agile and waterfall model?

OR

- Q6)** a) Discuss “automation in extreme programming”. [7=3+4]
b) What are some of the challenges in automating the testing of GUI portions of an application? How do these compare with the automation of back-end testing?

P.T.O.

Q7) a) What is Selenium? What are the different Selenium components?
[16=6+5+5]

- b) What are the limitations of Selenium?
- c) Why one should select selenium as a test tool?

OR

Q8) a) Describe selenium Web Driver architecture with the help of neat diagram.
[16=6+5+5]

- b) What is Selenium? What are the different features of it?
- c) Enlist and explain the components of selenium tool.

Q9) a) What does SQA ensure? What are the goals of SQA? [17=6+6+5]
b) State & explain Principles of Quality management.
c) What is ISO standard? What are its advantages?

OR

Q10) a) What is Six Sigma? Explain the terms DMAIC & DMADV.
[17=6+6+5]

- b) Define Software Quality & Software Quality Assurance. List the various objectives of SQA.
- c) How cost and risk factors are affecting software quality.

Q11) a) Enumerate Ishikawa's seven basic quality tools. Explain any two in detail.
[17=6+6+5]

- b) Describe key elements of Total Quality Management.
- c) Explain with example Product Quality Metric.

OR

Q12) a) Write short note on Total Quality Management (TQM). [17=6+6+5]
b) Explain following terms (any two)

Pareto Chart

Scatter Diagrams

Cause and effect diagrams.

- c) Describe in detail Defect Removal Effectiveness.

Total No. of Questions : 8]

SEAT No. :

P3340

[Total No. of Pages : 5

[5461] - 600

B.E. (Computer Engineering)
OPERATION RESEARCH

(2015 Pattern) (Semester - I) (410245 C) (Elective - II) (End sem.)

Time : 2½ Hours]

/Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right side indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Make suitable assumptions whenever necessary.

Q1) a) Explain the various special cases in Linear Programming Problems with suitable examples. [6]

b) Give the Correspondence between entities in primal and dual for a linear programming problem with an example. [6]

c) Make dual for following Linear Programming Problem. [8]

$$\text{Minimize } Z = 50 x_1 + 30 x_2 + 26 x_3$$

Subject to constraints:

$$2x_1 + 0.5x_2 + x_3 \geq 25$$

$$x_1 + 3x_2 + 2x_3 \geq 30$$

$$2x_1 + x_2 + x_3 \geq 40$$

$$x_1, x_2 \geq 0$$

OR

Q2) a) What is an un-balanced transportation problem? How is it balanced? What are the specific costs to be considered while balancing the same? Explain with an example. [6]

b) Solve the following two-variable linear programming problem graphically.

$$\text{Minimize } Z = 20 x_1 + 40 x_2$$

[6]

Subject to constraints:

$$36x_1 + 6x_2 \geq 108$$

$$3x_1 + 12x_2 \geq 36$$

$$20x_1 + 10x_2 \geq 100$$

$$x_1, x_2 \geq 0$$

P.T.O.

- c) Consider the effectiveness of salesmen of a company in different cities. Determine how to assign the salesman effectively so as to get maximum effectiveness. [8]

		Cities			
Salesman		A	B	C	D
	1	42	35	28	21
	2	30	25	20	15
	3	30	25	20	15
	4	24	20	16	12

- Q3)** a) Solve the following $2 \times m$ game using the graphical method. [8]

	B1	B2	B3	B4
A1	2	-1	5	-2
A2	-2	4	-3	1

- b) Solve the following game using linear programming. [8]

	B1	B2	B3
A1	5	3	7
A2	7	9	1
A3	10	6	2

OR

- Q4)** a) A 10 Kg Knapsacks to be filled with items as given in table. The knapsack is to be filled to maximize the benefits. Use Dynamic Programming approach to solve the problem. [8]

Item No.	Weight (Kg)	Benefit
1	4	11
2	3	7
3	5	12

- b) Solve the following game using linear programming. [8]

	B1	B2	B3
A1	2	5	6
A2	7	3	4

- Q5) a)** The following details are available regarding a project. Draw the Network Diagram. Identify the critical path, the critical activities and the duration of project completion. [8]

Path	Time Duration (Weeks)
1-2	5
1-3	6
1-4	3
2-5	5
3-6	7
3-7	10
4-7	4
5-8	2
6-8	5
7-9	6
8-9	4

- b)** The following details are available regarding a project. Determine the earliest start time and latest finish times, the total float for each activity. [8]

Path	Predecessor (Activity)	TimeDuration (Weeks)
A	--	2
B	--	1
C	B	2
D	A,B	2
E	A,C	3
F	A	2
G	A	1
H	C,G	1
I	H	1
J	I	3
K	C,F	4

OR

- Q6) a)** The following details are available regarding a project. Draw the Network Diagram. Determine the critical path, the critical activities and the project completion time. [8]

Activity	Predecessor (Activity)	Duration (Weeks)
A	--	2
B	--	3
C	A,B	2
D	A,B	2
E	D	3

- b)** The following details are available regarding a project. Determine the earliest start time and latest finish times, the total float for each activity. [8]

Path	Predecessor (Activity)	Time Duration (Weeks)
A	A	30
B	A	5
C	A	2
D	C	3
E	C	7
F	E	25
G	E	15
H	G	10
I	H	2
J	I,F,D,B	10
K	I,F,D,B	15
L	J,K	30

- Q7) a)** A company manufactures tables and chairs. They make profit of Rs. 200 per table and Rs. 80 per chair. Production of a table requires 5 hours of assembly and 3 hours in finishing. Production of a chair requires 3 hours of assembly and 2 hours of finishing. The company has 105 hours of assembly time and 65 hours of finishing time. The company manager is interested to find out the optimal production of tables and chairs so as to have a maximum profit of Rs. 4000. Formulate a goal programming problem for this situation. [9]

- b) A company wishes to launch one of the three products in the market. The fixed and variable costs of the products are as given below. The likely demand in units of these products can 3,000, 6,000 or 9,000 depending upon Poor, Moderate or High demands. The selling price of each type of product is Rs. 20.

Prepare the payoff matrix. If the index of optimism is taken to be 0.75, which product would the company launch in the market. [9]

Product	FixedCost (Rs)	VariableCost per Unit (Rs)
A	20,000	15
B	30,000	12
C	50,000	8

OR

- Q8) a)** An Bakery produces two items Cake and Cookie. Both recipes are made of Wheat and Sugar. Production of one Kg of Cake requires 7 units of Wheat and 4 units of Sugar whereas for producing one Kg of Cookies requires 4 units of Wheat and 3 units of Sugar. The company has 145 units of Wheat and 90 units of Sugar. The Profit per Kg of Cake is Rs. 120 while that of Cookie is Rs. 90. The manager wants to earn a maximum profit of Rs. 2,700 and to fulfill the demand of 12 Kgs of Cake. Formulate a goal programming problem for this situation. [9]

- b) A company wishes to launch one of the three products in the market. The fixed and variable costs of the products are as given below. The likely demand in units of these products can 3,000, 6,000 or 9,000 depending upon Poor, Moderate or High demands. The selling price of each type of product is Rs. 20.

Prepare a payoff matrix. If the probabilities of occurrence of Poor, Moderate or High demands are 0.6, 0.3 & 0.1 respectively, Which product would the company launch in the market. [9]

Product	Fixed Cost (Rs)	Variable Cost per Unit (Rs)
A	20,000	15
B	30,000	12
C	50,000	8



Total No. of Questions : 10]

SEAT No. :

P4232

[Total No. of Pages : 2

[5461]-600-A
B.E. (Computer Engineering)
MOBILE COMMUNICATION
(2015 Pattern) (Semester - I) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What frequencies reuse and give its frequency reuse factor. [6]

b) Explain Cell Splitting give its feature. [4]

OR

Q2) a) Explain PCS Architecture in detail. [6]

b) Give detail Fading in Mobile Environment. [4]

Q3) a) Write short note on specialized MAC. [4]

b) Explain GMSK Modulation and give it type. [6]

OR

Q4) a) Explain Mobile Station and SIM. [6]

b) Short Note on HLR and VLR. [4]

Q5) a) GSM Architecture in detail. [6]

b) Explain GSM Identifiers. [6]

c) Short note on GSM bursts. [6]

OR

P.T.O.

Q6) a) Explain the block diagram of GPRS. [6]

b) Describe in detail Logical Channel for GSM. [6]

c) Write short note on GSM Frame. [6]

Q7) a) Explain Block diagram for UMTS in detail. [6]

b) Write short note on 3 GPP2 family CDMA 2000. [6]

c) Give detail HSPA. [4]

OR

Q8) a) What are the three main CDMA 2000 std and explain all three. [6]

b) Explain LTE in 4G. [6]

c) Give detail HSUPA [4]

Q9) a) Draw a diagram for Millimeter wave and explain it. [8]

b) Describe in detail Virtual reality and Augmented Reality. [8]

OR

Q10)a) Explain LTE based MULTIFIRE. [8]

b) Explain in detail URLLC. [8]



Total No. of Questions : 10]

SEAT No. :

P3341

[5461]-601

[Total No. of Pages : 2

B. E. (Information Technology)
INFORMATION & CYBER SECURITY
(2015 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 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) Using the extended Euclidean algorithm, find the multiplicative inverse of [5]

- i) $1234 \bmod 4321$
- ii) $24140 \bmod 40902$

b) State with example Euler's theorem. [5]

OR

Q2) a) What is the difference between a monoalphabetic cipher and a polyalphabetic cipher? Explain with example. [5]

b) What four requirements were defined for Kerberos? [5]

Q3) a) What characteristics are needed in a secure hash function? [5]

b) What protocols comprise SSL? Draw a neat diagram? What is the difference between an SSL connection and an SSL session? [5]

OR

Q4) a) What services are provided by IPSec? What is the difference between transport mode and tunnel mode in IPSec? [5]

b) Consider any 5 threats to web security and describe how each is countered by particular feature of SSL [5]

- i) Brute force attacks
- ii) Known plaintext attacks
- iii) Replay attacks
- iv) Man-in-the-middle attacks
- v) Password sniffing
- vi) IP spoofing
- vii) IP hijacking
- viii) SYN flooding

P.T.O.

Q5) a) Illustrate with a neat diagram components of risk identification and risk assessment. [8]

b) List and explain approaches to reduce impact of vulnerability exploitation through planning and preparation. [8]

OR

Q6) a) List and explain any four commandments of computer ethics. [8]

b) Illustrate the significance of IRP, DRP and BCP. [8]

Q7) a) What is cybersquatting? Who are cyber squatters and how does it work. [8]

b) Classify and explain cybercrimes against property. [8]

OR

Q8) a) What are social engineering attacks and classify and explain them? [8]

b) Explain in detail Indian legal perspective on cybercrimes. [8]

Q9) a) What is a phishing attack explain with an example. What are the different types of phishing? [12]

b) What is cyberstalking? Explain cyberstalking and explain how it works. [6]

OR

Q10)a) List any two network security scanners and explain the significance and working of the same. [12]

b) What are the properties a digital signature should have? [6]



Total No. of Questions : 10]

SEAT No. :

P3342

[Total No. of Pages : 3

[5461] - 602

B.E. (Information Technology)

MACHINE LEARNING & APPLICATIONS

(2015 Pattern) (414454) (End Semester)

Time : 2½ Hours]

/Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, and Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Explain with example k-fold cross validation. [5]

b) Write short note on Vapnik-Chervonenkis dimension. [5]

OR

Q2) a) Explain two methods for reducing dimensionality. [5]

b) Write short note on Gram Matrix with an example. [5]

Q3) a) What are support vector margins and also explain soft margin. [5]

b) Explain the term bias-Variance dilemma. [5]

OR

Q4) a) Explain Predictive and descriptive task. [5]

b) Explain Perceptron training algorithm for linear classification. [5]

Q5) a) Consider following five data points: [12]

(0,3), (3,3) (3,0), (-2,-4) and (-4,-2)

Clusters are formed as follows:

P.T.O.

Case 1:

- A. First two points together in one cluster.
- B. Remaining three in another cluster.

Case 2:

- A. First three points together in one cluster.
- B. Remaining two in another cluster.

Find Out:

- i) Within-cluster scatters for both cases.
- ii) Between-cluster scatters for both cases.
- iii) Also comment which clustering produces tighter cluster whose centroids are further apart.

- b) Define and explain following terms. [6]
- i) Minority Class.
 - ii) Gini Index.
 - iii) Entropy.

OR

- Q6)** a) Find all association rules in the following database in the following database with minimum support = 2 and minimum confidence = 65%. [10]

Transactions	Data Items
T1	Milk, Bread, Cornflakes
T1	Bread, Jam
T1	Milk, Bread, cornflakes, Jam
T1	Milk, cornflakes
T1	Bread, Butter, Jam
T1	Bread, Butter
T1	Milk, Bread, Butter

- b) Consider following splits having four features: [8]

$$\text{Length} = [3, 4, 5] \quad [2+, 0-][1+, 3-][2+, 2-]$$

$$\text{Gills} = [\text{Yes}, \text{No}] \quad [0+, 4-][5+, 1-]$$

$$\text{Beak} = [\text{Yes}, \text{No}] \quad [5+, 3-][0+2-]$$

$$\text{Teeth} = [\text{many}, \text{few}] \quad [3+, 4-][2+, 1-]$$

Find

Total weighted Entropy & Gini-index of all Features.

Q7) a) Define Bayes Rule and solve following example. [8]

Example:

5% of people in a city having cancer. In that city 10% people are smoker, Also 20% of people with cancer and smoker.

Find out the probability of people who are smoker possess cancer.

b) Define [8]

- i) Bernoulli's distribution
- ii) Binomial distribution.
- iii) MAP decision rule.
- iv) Maximum likelihood function.

OR

Q8) a) For the given dataset apply Naïve Bayes algorithm and predict the outcome for the car={Red, Domestic, SUV}. [8]

Color	Type	Origin	Stolen
Red	Sports	Domestic	Yes
Red	Sports	Domestic	No
Red	Sports	Domestic	Yes
Yellow	Sports	Domestic	No
Yellow	Sports	Imported	Yes
Yellow	SUV	Imported	No
Yellow	SUV	Imported	Yes
Yellow	SUV	Domestic	No
Red	SUV	Imported	No
Red	Sports	Imported	Yes

b) Write short note on GMM. [8]

Q9) a) Write short note on Feed - forward Neural Network. [8]

b) Write short note on Ensemble learning. [8]

OR

Q10)a) Explain why we use non-linearity function? States & explain 3 types of neurons that add non-linearity in their computations. [8]

b) Write short note on Reinforcement learning. [8]



Total No. of Questions : 10]

SEAT No. :

P3343

[5461]-603

[Total No. of Pages : 4

B.E. (Information Technology)
SOFTWARE DESIGN AND MODELING
(2015 Pattern) (Semester - I) (414455)

Time : 2½ Hours]

/Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Question 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) a) Enlist explain different kinds of relationships used in class diagram. [4]

b) Passport automation system : Passport Automation system is used in the effective dispatch of passport to all of the applicants. This system adopts a comprehensive approach to minimize the manual work and schedule resources, time in a cogent manner. The core of the system is to get the online registration form (with details such as name, address etc.,) filled by the applicant whose testament is verified for its genuineness by the passport Automation system with respect to the already existing information in the database. This forms the first and foremost step in the processing of passport application. After the first round of verification done by the system, the information is in turn forwarded to the regional administrator's (Ministry of External Affairs) office. The application is then processed manually based on report given by the system, and any forfeiting identified can make the applicant liable to penalty as per the law. The system forwards the necessary details to the police for its separate verification whose report is then presented to the administrator. After all the necessary criteria have been met, the original information is added to the database and the passport is sent to the applicant.

Identify Actors, Use-cases and Draw Use-Case Diagram (s) for above Case study. [6]

OR

Q2) a) Elaborate the keyword class, association name, association end name and multiplicity with an example. [4]

P.T.O.

- b) Given the following problem description, produce an object oriented solution. Answer the following questions about your object-oriented solution. [6]

Design a simulation of a basketball conference. Each conference has 10 teams. Each team has 12 players. Each player has a specific height, speed, and accuracy. Players know which team they belong to. Some players are scholarship players. Scholarship players need to record their current grade-point average. Players may be transferred between teams. Teams play basketball games against other teams in the conference. The result of each game is determined using a function based on the height, strength, speed, and accuracy of the players on each team.

- i) Identify all software classes, their attributes & methods.
- ii) Draw a Software class diagram showing associations between classes and multiplicities.
- iii) Which objects contain other objects?
- iv) Which objects exhibit super-class sub-class relationship?

- Q3)** a) Assume a home telephone instrument and give the meaning of Event, State and transition. [4]

- b) Online Course Reservation System: [6]

The requirement form the customer is got and the requirements about the course registration are defined. The requirements are analyzed and defined so that is enables the student to efficiency select a course through registration system. Whenever the student comes to join the course he/she should be provided with the list of course available in the college. The system should maintain a list of professor who is teaching the course. At the end of the course the student must be provided with the certificate for the completion of the course.

Draw the sequence diagram (s) for the above case study.

OR

- Q4)** a) Explain concurrent sub-states with suitable examples. [4]

- b) Draw activity diagram for the library case study shown below. List all activities used in the diagram. [6]

Library Case study:

Following is a process to issue a book:

Every book has a barcode sticker pasted on it. Every employee has I-card on which also barcode sticker is pasted. Employee has to select a book and has to approach librarian. Librarian scans the barcode of the book with barcode scanner. Then employee has to scan barcode on I card with barcode scanner. Librarian has to ensure book details, employee details and finalize the issue transaction of the book. Librarian tells return date to an employee.

Following is the process to return the book:

Employee has to carry the book to the librarian and librarian has to initiate the return transaction. Employee has to scan barcode sticker of I-card and book with barcode scanner. System calculates fine by using fine calculation rules. Librarian asks for fine amount to employee if any. Employees pay the fine. Librarian finalizes the return transaction. Note that, in above system, if barcode scanner does not work, librarian should be able to enter data using keyboard. There should be provision of providing rules of fine calculation. Even if employee doesn't have barcode sticker on I - card, librarian should be able to input employee id manually.

- Q5)** a) Explain the process of creating an access for business Classes with Diagram. [8]
b) Consider bank ATM database system and explain creation of object Model by giving one example each for - [8]
- i) Table - class mapping
 - ii) Table Multiple classes mapping
 - iii) Table - inherited classes mapping
 - iv) Tables-inherited classes mapping

OR

- Q6)** a) Explain the Macro - Level process of identification of view layer classes by analyzing use case. [8]
b) A university is having several departments. Each Department should have minimum one faculty member to maximum of 10 faculty member. Each faculty member has residential address within proximity within 2kms. Attribute of entities are. Department: department name, department type, department start date, current HOD Faculty: Facultyid, Facultyname, subject specialization, Joiningdate, DOB, Salary Address: building name, Flatno, Streetname, Landmark, Pincode, state Country.
Develop the design level business layer class diagram using OCL Attribute and Method representation, and Multiplicity between business classes. [8]

Q7) a) Explain Strategy Pattern.

Suppose we have an Invoice class in a payment system in which we have to calculate total amount payable but requirement says that amount of calculation depends on member customer or non member customer. Draw a class diagram showing strategy pattern.

[8]

b) Define a Design Pattern? Explain the Classification of GOF design pattern? Name the types of Design patterns with one example of Each type. [8]

OR

Q8) a) Name the types of GRASP design Patterns with one example of each type. [8]

b) A chess game includes 2 players, 32 pieces (16 per player) and a game board with 64 squares. Draw a class diagram for Chess game showing Creator and Polymorphism GRASP Pattern. [8]

Q9) a) Explain types of Software Architectural pattern. [10]

b) Explain any two client / service software architecture pattern with deployment diagram and its example. [8]

OR

Q10) Write Short note on: [18]

- a) Software Architectural Broker Pattern.
- b) Control pattern for real time software architecture.
- c) Software process Model for software Product line.



[5461] - 604

B.E. (I.T.) (Semester - I)
WIRELESS COMMUNICATIONS
(2015 Pattern) (Elective - I)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain in detail 3G cellular systems. [5]
b) What are advantages of Bluetooth? Explain in detail Bluetooth Technology. [5]

OR

- Q2)** a) Explain in detail cellular mobile telephone system. [5]
b) What are common wireless communication systems? Explain in detail any one system. [5]

- Q3)** a) Write short note on: Cell Splitting and Cell Sectoring. [5]
b) How frequency reuse technique used in cellular system? [5]

OR

- Q4)** a) What is small scale fading? Explain in detail small scale fading. [5]
b) Explain in detail two ray Rayleigh Fading model. [5]

- Q5)** a) Explain in detail TDMA. [6]
b) Explain in detail Direct-Sequence CDMA and CSMA. [8]

OR

- Q6)** a) How IS-95 system is working? Explain in detail. [8]
b) Explain in detail spectrum utilization in Digital wireless mobile system. [6]

- Q7)** a) Explain in detail GSM system architecture. [6]
b) Write short note on: GPRS system architecture. [6]
c) Explain in detail localization and calling in GSM. Explain in detail GSM system architecture. [6]

OR

P.T.O.

- Q8)** a) Explain in detail CDMA 2000 cellular technology. [6]
b) What is Handover Technique? Explain in detail Handover Technique. [6]
c) Why security is required in GSM? Explain in detail Authentication and security in GSM. [6]
- Q9)** a) Explain in detail ZigBee Network. [6]
b) What is WiFi? Explain in detail Wi-Fi technology. [6]
c) Explain in detail Wireless Adhoc Network and Mobile portability. [6]
- OR
- Q10)** a) Write short note on: Software Defined Radio. [6]
b) Explain in detail WiMAX technology. [6]
c) Write short note on: Security issues and challenges in Wireless network. [6]



Total No. of Questions : 10]

SEAT No. :

P3344

[5461]-605

[Total No. of Pages : 2

B.E. (Information Technology)

**NATURAL LANGUAGE PROCESSING (Paper - B)
(2015 Pattern) (Semester - I) (End Sem.) (Elective - I)**

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) State and explain applications of Natural Language Processing. [5]
- b) Draw and explain flow of information in natural language understanding system. [5]

OR

- Q2)** a) What is Natural Language Processing (NLP)? Explain Parsing in NLP.[5]
- b) Why augmented transition networks are used in NLP? Explain with suitable example. [5]

- Q3)** a) What are the issues in lexicon design? Why there is need of morphological analysis? Explain with example. [5]
- b) Expand the following abbreviated constituents and rules into their full feature structure format. [5]

(S[-inv, Q] AGR ? a)

NP[R,-gap]

VP → V[np_s:inf] NP S[inf]

OR

- Q4)** a) How does context dependant Best-First Parser works? Explain with suitable example. [5]

P.T.O.

- b) Write a grammar with features that will successfully allow the following phrases as noun phrases : [5]

three o'clock	quarter after eight
ten minutes to six	seven thirty-five
half past hour	

but will not permit the following

half to eight	three twenty o'clock
ten forty-five after six	

- Q5)** a) Describe estimating probabilities for part of speech tagging. [8]
b) What is probabilistic context-free grammar? Explain with suitable example. [8]

OR

- Q6)** a) What is the use of Viterbi algorithm? Explain with suitable example. [8]
b) How does Shift Reduce Parser encode uncertainty to improve the efficiency while parsing? Explain with proper example. [8]

- Q7)** a) Describe in detail the semantic interpretation using feature unification.[10]
b) Explain the word senses and ambiguity in natural language processing.[8]

OR

- Q8)** a) Describe in detail the lexicon with semantic interpretation. Give example. [10]
b) Explain with examples semantic filtering using selectional restrictions.[8]

- Q9)** a) Explain in detail automating deduction in logic based representation. [8]
b) Describe the techniques for matching possible interpretations to expectations. [8]

OR

- Q10)**a) How to interpret logical form expressions as procedures using procedural semantics. [8]
b) Describe with example the method for expectation matching to identify reference. [8]



Total No. of Questions : 10]

SEAT No. :

P3345

[5461]-606

[Total No. of Pages : 2

B.E. (I.T.)

USABILITY ENGINEERING
(2015 Course) (Semester - I) (End Sem.) (Elective - I) (414456C)

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain Usability attribute Memorability with example. [6]

b) How “good error” messages guide user to solve system problems. [4]

OR

Q2) a) How will you measure the usability of Automated Teller Machine(ATM) interface with respect to traditionally associated usability attributes? [6]

b) Why we require short cut keys in user interface? [4]

Q3) a) How meaningful messages help user to achieve the goal. [6]

b) Explain the importance of prioritizing usability activities. [4]

OR

Q4) a) Describe with example full screen interfaces. [6]

b) How goal setting method is used for new versions of existing system. [4]

Q5) a) Explain different stages of usability testing with example. [10]

b) What are the ethical aspects of tests with human subjects? [8]

OR

P.T.O.

Q6) a) How Questionnaires & Interviews are helpful to understand user satisfaction about interface? [10]

b) Explain Test Budget in detail. [8]

Q7) a) List & explain guidelines for Internationalization. [8]

b) Which are the general guidelines used by android operating system which causes it is globally accepted in smart phone. [8]

OR

Q8) a) How user & Vendor Benefit from Consistency and Standards? [8]

b) Write a short note on : In-House standard. [8]

Q9) a) Describe Simulation with example. [8]

b) Explain CAUSE tools with example. [8]

OR

Q10) Write a short note on(Any 2) [16]

a) Virtual Reality

b) Technology transfer

c) Ubiquitous Computing



Total No. of Questions : 10]

SEAT No. :

P3739

[Total No. of Pages : 2

[5461]-607

B.E. (Information Technology)

MULTICORE AND CONCURRENT SYSTEMS (Elective - I)
(2015 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Question 1 or 2, 3 or 4, 5 or 6, 7 or 8 and 9 or 10.
- 2) Neat Diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.

- Q1)** a) Explain different types of security attacks with examples. [5]
b) What is the difference between Single-program, multiple-data and Multiple-program, multiple-data structure patterns. [5]

OR

- Q2)** a) What is the need of Intrusion Detection System (IDS)? What are its limitations? [5]
b) What are different decomposition patterns? Explain any one of them in detail. [5]

- Q3)** a) Explain the concept of semaphore? Explain its significance in Readers Writers Problem. [4]
b) Explain Fork/join, Loop parallelism Program structure patterns. [5]

OR

- Q4)** a) Explain PCAM methodology. [5]
b) What is the difference between dynamic and static thread management. [4]

- Q5)** a) What is a race condition? Explain manual partitioning without a race condition in OpenMP. [8]
b) Write short note on Loop-level parallelism and Task parallelism in OpenMP. [9]

P.T.O.

OR

- Q6)** a) Explain different OpenMP constructs in detail? [8]
b) Explain OpenMP execution model with diagram and significance of OpenMP. [9]

- Q7)** a) Explain Point-to-Point communication and Buffered communications for MPI. [8]
b) Explain Non-blocking communications and Collective communications for MPI. [9]

OR

- Q8)** a) How MPI process are combined with threads? [8]
b) How MPI programs are debugged? Explain significance of Boost MPI Library. [9]

- Q9)** a) Explain CUDA's Programming model. [9]
b) Explain the complete CUDA compilation process with diagram. [8]

OR

- Q10)** a) How Dynamic parallelism takes place in GPU programming. [8]
b) Draw memory hierarchy in CUDA and Explain along with thread hierarchy. [9]



Total No. of Questions : 10]

SEAT No. :

P3346

[5461]-608

[Total No. of Pages : 2

B.E. (Information Technology)

BUSINESS ANALYTICS AND INTELLIGENCE

(2015 Pattern) (Semester - I) (End Sem.) (Elective - I) (414456E)

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Explain the role of decision support system with its main components? [6]

b) What are the different factors responsible for successful BI projects, briefly explain. [4]

OR

Q2) a) Explain data visualization. Explain the job responsibilities of BI analysts for creating data visualizations. [6]

b) Explain the four stages of Simon's decision making process. [4]

Q3) a) What is dashboard, explain different types of dashboards? [6]

b) What are different types of charts? Explain any two? [4]

OR

Q4) a) Describe the approaches of decision makers? [6]

b) Explain the importance of data visualization techniques? [4]

Q5) a) Explain the phases of BPM cycle. [8]

b) Differentiate between dashboards & scoreboards. [8]

OR

P.T.O.

- Q6)** a) Explain the purpose of performance measurement system and how organizations need to define key performance indicators? [8]
b) Write the benefits of using balanced score cards vs using six sigma in a performance measurement systems. [8]

- Q7)** a) Explain the role of BI in ERP with an example? [8]
b) Explain the different ways BI software's can help in improving sales & marketing process. [8]

OR

- Q8)** a) Explain in detail the role of BI in Finance Sector? [8]
b) What are the various domains where BI can be used and explain any four BI applications. [8]

- Q9)** a) Explain different levels of BI maturity? [10]
b) Explain the main challenges and potential solutions for the Pervasive BI maturity? [8]

OR

- Q10)** a) Explain with an example, how the customer experience helps in building an effective BI systems? [10]
b) Write a short note on
i) Geographic BI systems
ii) Social BI systems



Total No. of Questions : 10]

SEAT No. :

P3347

[Total No. of Pages : 2

[5461]-609

B.E. (I.T)

SOFTWARE DEFINED NETWORKS

(2015 Pattern) (Semester - I) (End Sem) (Elective - II) (414457A)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4 or Q5 or Q6, Q7 or Q8 Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) Explain the three layer SDN framework? [6]
b) What are the functions of SDN controller? List fundamental characteristics of SDN. [4]

OR

- Q2)** a) What does decoupling SDN Hardware from Software mean? [6]
b) What is the necessity of SDN? Enlist the Applications of SDN. [4]

- Q3)** a) Explain the role of dual function switches in hybrid open flow switches [5]
b) Network can be implemented as a service. Justify [5]

OR

- Q4)** a) How openflow pipeline model increases packet processing efficiency. [5]
b) What is the role of flow and group tables in packet forwarding. [5]

- Q5)** a) Explain SDN controller functional components? [8]
b) Explain with reasons that encourage a controller to delegate functions in data plane? [8]

OR

P.T.O.

- Q6)** a) Illustrate with an example peer-peer controller coordination? [8]
b) How a SDN controller administers shared resources? [8]

- Q7)** a) Distinguish between software-based data plane and hardware-based data plane. [8]
b) How Do Northbound APIs Work? [8]

OR

- Q8)** a) Explain the functions of data plane in SDN architecture. [8]
b) Write the classification of programming languages for SDN. [8]

- Q9)** a) What are the factors that cause VM migration [6]
b) Orchestration is an important function of multitenant data center. Justify? [6]
c) Explain the multitenant data center architecture. [6]

OR

- Q10)** a) Explain the concept of service engineered path. [6]
b) Distinguish between NFV and NV. [6]
c) Link Layer Discovery protocol is used to understand the network device capabilities in Layer 2 LAN in SDNs. Justify? [6]



Total No. of Questions : 10]

SEAT No. : _____

P3740

[Total No. of Pages : 2

[5461]-610

B.E (I.T.)

SOFT COMPUTING

(2015 Pattern) (Semester - I)

Time : 2.5 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q. No. 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Explain in brief constituents of Soft Computing with eg. [6]
b) What is fuzzy logic? Enlist it's application areas. [4]

OR

- Q2)** a) Explain working of Perceptron model with suitable diagram. [6]
b) What are various applications of Neural Networks. [4]

- Q3)** a) Explain working of Bayesian Neural Networks with suitable diagram. [6]
b) Explain learning methodology in SOM. [4]

OR

- Q4)** Write short notes on following (Any Two) [10]
a) ART
b) Boltzmann Machines
c) Evolutionary computing
d) Multi Layer Feed Forward Network

- Q5)** a) Explain the working of fuzzy inference system with suitable diagram. [8]
b) What are merits and demerits of fuzzy logic? [4]
c) Give comparison between traditional algorithm and Genetic Algorithm. [4]

P.T.O.

OR

- Q6)** a) What is Defuzzification? Explain any two methods of it with suitable eg. [8]
b) Explain how Genetic Algorithms are different from conventional optimization algorithms. [8]

- Q7)** a) With a neat flowchart, explain the operation of a simple Genetic Algorithms. [8]
b) Enlist and Explain in brief types of Genetic Algorithms. [8]

OR

- Q8)** a) Explain the concept of fuzzy logic controlled Genetic Algorithms with suitable diagram. [8]
b) State the importance of Genetic Algorithms. Discuss various advantages and disadvantages of it. [8]

- Q9)** a) Explain the working of Genetic Algorithm based back propagation network with suitable diagram. [10]
b) Enlist and explain at least four applications where fuzzy logic is applicable with appropriate justification. [8]

OR

- Q10)** Write Short Notes on following : (Any Three) [18]

- a) Mamdani Fuzzy Model
- b) Triangular Fuzzy Set
- c) Genetic Programming
- d) Ant Colony Optimization
- e) Neuro Fuzzy Hybrid Systems



Total No. of Questions : 10]

SEAT No. :

P3348

[Total No. of Pages : 2

[5461]-610-A

B. E. (I. T.)

**SOFTWARE TESTING AND QUALITY ASSURANCE (414457 C)
(2015 Pattern) (Semester - I) (End Semester Exam) (Elective-II)**

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

Q1) a) What are various testing principles? [6]

b) Explain white box testing and black box testing. [4]

OR

Q2) a) What is six sigma? Explain its methodologies? [6]

b) Explain tester's role in software development organization. [4]

Q3) a) Explain different types of system testing. [6]

b) Describe TQM for inventory management. [4]

OR

Q4) a) Draw a control flow graph for the following code and clearly label each node so that it is linked to its corresponding statement. [6]

```
int evensum (int i) {  
    int sum = 0;  
    while (i <= 10) {if (i/2 == 0)  
        sum = sum + i; i++;  
    }  
    return sum;  
}
```

b) Write a short note on FMEA. [4]

P.T.O.

- Q5)** a) Explain 7 QC tools in detail. [8]
b) Explain planning for software quality assurance w.r.t. to your final year project. [8]

OR

- Q6)** a) Relate how components of SQA system can be applied for your final year project. [8]
b) Explain product and process quality with an example. [8]

- Q7)** a) Explain Malcom Baldrige Model? [8]
b) Draw and explain CMMI levels. [8]

OR

- Q8)** a) Write short note on following [8]
i) CMM
ii) SPICE
b) Explain in detail ISO 9000 model for quality assurance. [8]

- Q9)** a) Write shot note on: [10]
i) OO Methodology
ii) Walkthrough
b) Explain Clean room methodology in detail along with diagram. [8]

OR

- Q10)**a) i) Explain Software project Internal Auditing and Assessments. [10]
ii) Explain how different Case Tools affects on software Quality.
b) Consider online banking system, state and inject 5 defect in the system which will cause flaw in the system and suggest it's preventive measures. [8]



Total No. of Questions : 8]

SEAT No. :

P3349

[Total No. of Pages : 2

[5461]-610-B

B. E. (I. T.)

COMPILER CONSTRUCTION

(2015 Course) (Semester - I) (414457D) (Elective-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) Explain Predictive Parsers with suitable example. [6]
b) Describe tree operators for intermediate representation. [6]
c) Explain call by name and call by need with respect to lazy evaluation. [8]

OR

- Q2)** a) Compare LL and LR Parsers with suitable examples. [6]
b) Explain single inheritance of data fields in object oriented languages. [6]
c) Explain reference counting for garbage collection. Discuss the problems with this technique using suitable example. [8]

- Q3)** a) With suitable diagram explain compiler phases of polymorphic languages. [6]
b) What are the different techniques to speed up the data flow analysis. [8]
c) Explain implicit and explicit parametric polymorphism with suitable example. [4]

OR

- Q4)** a) Explain transformations using data flow analysis with suitable examples. [10]
b) Explain variable analysis based on type and based on flow. [8]

P.T.O.

Q5) a) What is SSA? Explain Informal Semantics of SSA with suitable example. [8]

b) Write an algorithm to convert program to SSA . [8]

OR

Q6) a) Explain various loop optimization techniques. [8]

b) How Single Static Assignment is useful? [8]

Q7) a) Illustrate the construction of the control-dependence graph. [8]

b) Explain Iterative modulo scheduling. [8]

OR

Q8) a) Give the simple heuristics used for branch prediction. [8]

b) Can alignment of data blocks improve the compiler's performance?
Justify your answer. [8]



Total No. of Questions : 10]

SEAT No. :

P3350

[Total No. of Pages : 2

[5461]-610-C

B. E. (I. T.)

GAMIFICATION

(2015 Pattern) (Elective - II) (End Semester) (Semester- I)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Questions Q1 or Q2 and Q3 or Q4 and Q5 or Q6 and Q7 or Q8 and Q9 and Q10.*
- 2) *Draw neat diagrams and assume suitable data wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) a) What is Gamification? Explain the categories of Gamification with example. [5]

b) What is Gamocracy? [5]

OR

Q2) a) Explain the triple fallacy in Gamification [5]

b) Write short note on following : Maze problem in view of gamification. [5]

Q3) a) Explain Token Economies and the Allure of Scoring with example. [5]

b) Why people play games. Explain different player types. [5]

OR

Q4) a) Write short note on Re-framing Context: 1) Communicology, 2) Apparatus [5]

b) Explain Counter-gamification. [5]

Q5) a) What are the four objectives to accomplish onboarding? Explain how Onboarding can be used in Game Mechanics. [10]

b) Describe how pattern recognition and collecting game mechanics can be useful for gamified system. [8]

OR

Q6) a) Explain any five mechanics which can be used in any gamified system designed for solving social problems. [10]

b) Explain how social engagement loop motivating emotions leads to player re-engagement. [8]

P.T.O.

- Q7)** a) What is role of level model? How levels will be awarded to player? Write simple pseudo code for creation of level table which reflect level number, name of the level and points required to award the level. [8]
- b) Describe Health Month point system to nudge players towards their GOALS. [8]

OR

- Q8)** a) Explain in brief how level model, user model and event model can be created. [8]
- b) How concept of gamification can be used to develop any online technical Discussion forum like Quora? [8]

- Q9)** a) How Bigdoor platform can be used to develop Loyalty program. [8]
- b) Explain the various features of Git Hub? [8]

OR

- Q10)** a) List and explain the features of any gamification server. [8]
- b) Explain useful features of mambo. How mambo platform can be used for e-learning. [8]



Total No. of Questions : 10]

SEAT No. :

P3741

[Total No. of Pages : 2

[5461]-611

B.E. (Chemical)

PROCESS DYNAMICS AND CONTROL
(2015 Pattern)

Time : 2.5 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 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) Derive the Input-Output model for the stirred-tank heater. [5]
b) A mercury thermometer having a time constant of 30 seconds is initially at 50°C. The thermometer is placed in a temperature bath maintained at 90°C. Determine thermometer reading at 1.2 minute. [5]

OR

- Q2)** Derive expression for Dynamic Behavior of Feedback Controlled Process.[10]

- Q3)** Using the Routh criterion, explain for stability of

$$GH = \frac{K(S+2)}{S(S+1)(2S+1)}. \quad [10]$$

OR

- Q4)** a) Derive transfer function for interacting capacities. [5]
b) Discuss about the characteristic equation for generalized feedback system. [5]

- Q5)** a) Explain the Bode Stability Criteria with suitable Bode plots. [10]
b) Discuss about the Gain and Phase margins. [8]

OR

P.T.O.

Q6) a) Draw Bode diagram for [12]

$$GH = \frac{(S+1)}{(0.1S+1)(10S+1)}$$

Explain for stability.

b) Explain and draw the Nyquist plots for First and Second order systems. [6]

Q7) a) Explain Selective Control system. [8]

b) Explain feed forward control system. [8]

OR

Q8) a) Explain adaptive control system. [8]

b) Explain cascade control system for Heat Exchanger. [8]

Q9) a) Explain Digital approximation of classical controllers in detail. [8]

b) Explain the role of digital computer in process control as process interface for data acquisition and control. [8]

OR

Q10) a) Explain the need of reconstruction of continuous-time signals from discrete-time signals using hold elements. [8]

b) Explain the microcomputer-based controls. [8]



Total No. of Questions : 10]

SEAT No. :

P3742

[Total No. of Pages : 3

[5461]-612

B.E. (Chemical Engg.)

CHEMICAL REACTION ENGINEERING - II
(2015 Pattern)

Time : 2.5 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data if necessary.

- Q1)** a) With a neat diagram explain the steps in Shrinking Core Model. [5]
b) A feed consisting of 30% of 50 μm radius particles, 40% of 100 μm radius particles and 30% of 200 μm radius particles, is to be reacted in a fluidized bed steady flow reactor constructed from a vertical 2-m long 20-cm ID pipe. The fluidizing gas is the gas phase reactant. And at the planned operating conditions the time required for complete conversion is 5, 10 and 20 min for the three sizes of particles. Find the conversion of solids in the reactor for a feed rate of 2kg solids/min if the bed contains 10kg solids. [5]

OR

- Q2)** a) Derive an equation for the time for reaction in the Stokes regime for Shrinking Particle Model. [5]
b) In a gas phase particles of B are converted to solid product as follows : A (gas) + B (solid) \rightarrow R (gas) + S (solid). Reaction proceeds according to the shrinking core model with reaction control and with time for complete conversion of particles of 1hr. A fluidized bed is to be designed to treat 1ton/h of solids to 85% conversion using a stoichiometric feed rate of A fed at C_{A0} . Find the weight of the solids in the reactor if gas is assumed to be in mixed flow. Gas in the reactor is not at C_{A0} . [5]
- Q3)** a) Write in brief about reactive distillation and extractive reaction. [5]
b) Describe the BET method for the measurement of catalyst surface area. [5]

P.T.O.

OR

- Q4)** a) Explain the mercury penetration method. [5]
- b) Consider a case in which the reaction plane moves to the gas-liquid interface, hence the overall rate will be controlled by diffusion of A through the gas film. Raising C_B further has no effect on the overall rate. Reaction : A (g) + bB (l) \rightarrow product. Suggest suitable kinetic regimes and write the rate equation for the same. [5]
- Q5)** a) Derive an equation for determining the rate of independent deactivation for batch solids and batch fluid. [8]
- b) In the absence of pore diffusion resistance a particular first order gas phase reaction proceeds as : $-r_A''' = 10^{-6} \text{ mol/cm}^3 \text{ cat.s}$, at $C_A = 10^{-5} \text{ mol/cm}^3$, at 1 atm and 400°C. What size of spherical catalyst pellets ($D_e = 10^{-3} \text{ cm}^3/\text{cm cat. s}$) would ensure that pore resistance effects do not intrude to slow the rate of reaction? [8]

OR

- Q6)** a) A recycle reactor with a very high recycle ratio is used to study the kinetics of a particular irreversible reaction $A \rightarrow R$. For a constant flow rate of feed ($\tau' = 2 \text{ kg.s/liter}$) the following data are obtained : [9]

t, hr	1	2	4
X_A	0.889	0.865	0.804

The progressive drop in conversion suggests that the catalyst deactivates. Find the rate equations for the reaction and the deactivation which fit the data.

- b) Describe the different ways in which a catalyst may get deactivated. [7]
- Q7)** a) The following kinetic data for the reaction $A \rightarrow R$ are obtained in an experimental packed bed reactor using various amounts of catalyst and a fixed rate $F_{A0} = 10 \text{ kmol/h}$. [10]

W, kg cat	1	2	3	4	5	6
X_A	0.12	0.2	0.27	0.33	0.37	0.41

- i) Find the reaction rate at 40% conversion.
- ii) In designing a large packed bed reactor with feed rate $F_{A0} = 400 \text{ kmol/h}$. How much catalyst will be needed for 40% conversion?
- iii) How much catalyst would be needed in part.
- iv) If the reactor employed a very large recycle ratio

- b) Describe the basket type of reactor in terms of construction, functioning and type of flow. [8]

OR

- Q8)** a) A catalytic reaction $A \rightarrow 4R$ is carried out at 3.2 atm. and 117°C in a plug flow reactor which contains 0.01 kg of catalyst and uses a feed consisting of the partially converted product of 20 l/hr of pure unreacted A. The results are as follows : [10]

Run	1	2	3	4
$C_{A,in}$, mol/l	0.1	0.08	0.06	0.04
$C_{A,out}$, mol/l	0.084	0.07	0.055	0.038

Find a rate equation to represent this reaction. Also determine the amount of catalyst required in a packed bed with very large recycle rate for 35% conversion for a feed rate of 2000 mol/h of pure A at 3.2 atm. and 117°C.

- b) Explain how to determine controlling resistances in porous catalytic reactions. [8]

- Q9)** a) Explain the steps in the optimization of two-stage mixed flow reactors. [8]

- b) Explain enzymatic fermentation reaction. [8]

OR

- Q10)** a) Write the steps involved in designing a fluidized bed reactor. [8]

- b) With diagrams show and explain the possible different locations for heat exchangers in a two-stage plug flow reactors (with recycle) in series. [8]



Total No. of Questions : 10]

SEAT No. :

P4091

[Total No. of Pages : 3

[5461]-613

B.E. (Chemical) (Semester - I)

CHEMICAL ENGINEERING DESIGN - II
(2015 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q5. or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

Q1) Explain in brief O'Connell's and Van Winkle's correlations. **10]**
OR

Q2) Describe in brief internal components of packed absorption column with neat diagrams. **[10]**

Q3) Determine diameter of a sieve plate distillation column as per the specifications given below:-

Feed stram: 10% w/w acetone in aqueous stream, 96°C base temperature

Maximum feed rate : 12,000kg/h, 56°C top temperature

Number of theoretical stages = 16

Slope of bottom operating line = 5

Slope of Top operating line = 0.58

$X_D = 0.94$ (98% w/w)

$X_w = 50$ ppm

Reflux ratio = 1.30

Plate efficiency = 60%

Plate pressure drop = 100 mm

Vapour density at bottom = 0.74 kg/m³

Liquid density at bottom = 958 kg/m³

Surface tension at bottom = 58×10^{-3} N/m

Molecular weight = 18.4

P.T.O.

Vapour density at top = 2.05 kg/m^3

Liquid density at bottom = 754 kg/m^3

Surface tension at top = $23 \times 10^{-3} \text{ N/m}$

Molecular Weight = 56.1

K_1 at top = 0.09

and K_1 at bottom = 0.075

Take plate spacing = 0.5m & flooding 85%

[10]

OR

Q4) a) What do you mean by economic pipe diameter? [3]

b) Water is flowing through a pipeline at 1kg/s over a distance of 2.5 km. The impressed head of water is 10m. What is the pipeline size if density of flowing fluid is 1000 kg/m^3 and viscosity is 1 mNs/m^2 . [7]

Q5) a) Natural gas with a specific gravity of 1.2 at 14,300kPa and 45°C is blown down to 10,000kPa. The flow rate could be from $95\text{m}^3/\text{day}$ to $38 \text{ m}^3/\text{day}$. The drop through the pressure reducing regulator is 3100 kPa, leaving 1000 kPa for the pipe. The length of pipe is 140m upstream of the regulator and 8.9m downstream. Determine sizes of pipeline at upstream and downstream. [10]

Molecular weight of the gas = 20

Value of ψ = 0.6

b) State desirable piping materials for corrosion resistance. [6]

OR

Q6) a) Describe in brief:- Gaskets and their selection [8]

b) Describe in brief materials used for valves. [4]

c) Sulphuric acid solution having density 1850 kg/m^3 is flowing through a pipeline at a rate of 2 kg/s. Calculate the optimum diameter of the pipeline. Stainless steel pipe is to be used. [4]

Q7) a) Explain in brief : Psychrometric chart. [6]

b) Describe in brief : Secondary water treatment method. [8]

c) Write a short note on: Thermic fluids [4]

OR

- Q8)** a) Explain in brief how to design pipeline for transportation of crude oil. [10]
b) Describe in brief : Boiler mountings and their functions. [8]

- Q9)** a) Describe in brief : Types of plant maintenance. [8]
b) What do you mean by HAZOP? Explain in detail. [8]

OR

- Q10)** a) Explain in brief : Lubrication is a necessary part of plant maintenance. [8]
b) Describe in brief : Maintenance of Gate and Globe valves. [8]

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Total No. of Questions : 10]

SEAT No. :

P3351

[5461]-614

[Total No. of Pages : 1

B.E. (Chemical)

ENVIRONMENTAL ENGINEERING

(2015 Pattern) (Semester - I) (End Sem.) (Elective - I) (409344A)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

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

Q1) Why standards/limits are important pollution control studies? [10]

OR

Q2) Explain the harmful effects of SO_2 on human health? [10]

Q3) How adsorption is used for removal of SO_x ? [10]

OR

Q4) Explain the Operating principles of ESP with neat figure. [10]

Q5) Explain the effects of Pesticides pollution with example. [16]

OR

Q6) Draw a diagram of trickling filter. Label its parts and explain its mechanism. [16]

Q7) For values of K_1 equal to 0.1, 0.15, 0.2, and 0.3., Plot the ratio of the 5-day BOD to the ultimate BOD versus K_1 and explain the behavior of the curve. [18]

OR

Q8) A stream with a depth of 2m flows with a velocity of 0.25m/s. The DO concentrations, in the stream at 15°C is 4.2 mg/lit at a particular point. [18]

- a) What is the initial oxygen deficit?
- b) What is the rate of reaeration?
- c) What is the amount of oxygen added in 15 minutes?

Q9) Discuss Composting in detail. [16]

OR

Q10) What is Photo catalytic reactor? Explain the industrial use of it. [16]



Total No. of Questions : 10]

SEAT No. :

P3352

[5461]-615

[Total No. of Pages : 2

B.E. (Chemical)

MEMBRANE TECHNOLOGY

(2015 Course) (Semester - I) (Elective - I) (End Sem.) (409344B)

Time : 2½ Hours

/Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 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) Give benefits and draw backs of the membrane processes over conventional separation processes. [6]

- b) Define the following terms [4]
- i) Molecular wieght cut off
 - ii) Separation factor

OR

Q2) a) Explain in details selection criteria of membrane for industrial separation processes. [6]

- b) Define membranes? Give the types of membranes. [4]

Q3) a) Explain in details with sketches interfacial polymerization membrane casting. [5]

- b) Give short notes with neat sketches in vibrating and rotating modules. [5]

OR

Q4) a) Explain in details with neat sketches spiral wound module. [6]

- b) Give short notes on transport through micro porous and dense membrane. [4]

Q5) a) Explain in details with suitable example the concentration polymerization in gas separation processes. [8]

- b) Explain in details boundary layer film module. [8]

OR

P.T.O.

- Q6)** a) What is concentration polarization? And give the method of reducing it. [8]
b) Explain in details about fouling in membranes and method of reducing it. [8]

- Q7)** a) Define reverse osmosis? And explain in details with suitable sketches application of reverse osmosis for waste water treatment. [10]
b) Give the applications of microfiltration membrane for sterilization of wine and beer. [6]

OR

- Q8)** a) Describe in details application of ultrafiltration membranes in cheese production. [10]
b) Give the applications of Nano filtration membrane. [6]

- Q9)** a) Describe in details with suitable sketches, application of membrane for separation of carbon dioxide. [8]
b) Explain with suitable example and sketches membrane electrolysis. [10]

OR

- Q10)** a) What is desalination? Explain with suitable sketches desalination of brackish water. [8]
b) Describe in details application of membrane for recovery of metals from dilute solution. [10]



Total No. of Questions : 10]

SEAT No. :

P3353

[5461]-616

[Total No. of Pages : 2

B.E. (Chemical)

CORROSION ENGINEERING

(2015 Pattern) (End Sem.) (409344C) (Elective - I) (Semester - I)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

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

Q1) Explain thermodynamic aspects of corrosion and equilibrium potential with suitable examples. [10]

OR

Q2) Write the note on following [10]

- i) Specific conduction and Specific resistance.
- ii) Throwing power of plating bath.

Q3) Illustrate the need and significance of Pourbaix-diagram for Fe-H₂O system.[10]

OR

Q4) Discuss the advantages and disadvantages of Anodic control, Cathodic control and mixed control. [10]

Q5) a) Write a brief note on [8]

- i) Pitting Corrosion
- ii) Cavitations

b) Explain intergranular and stress corrosion cracking. Discuss the remedial measures for it. [8]

OR

P.T.O.

- Q6)** a) Explain the Pilling Bedworth ratio and describe its significance in the mechanisms of oxidation. [8]
- b) Describe the corrosion of iron and steel in aqueous media. Also explain how the parameters such as velocity, temperature and composition of media affects on corrosion. [8]

- Q7)** a) What are the different prevention techniques to minimize the corrosion? Write them in brief. [8]
- b) With suitable illustration justify “modification of the material by alloying and the appropriate heat treatment minimize the corrosion to a great extent”. [8]

OR

- Q8)** a) Explain the use of Tafel equation and Evans diagram with suitable illustrations. [8]
- b) Write a note on Nernst equation for electrode potential and that to corrosion reactions also. [8]

- Q9)** a) Explain polarization and corrosion potentials. Also explain how the reference electrodes are useful for corrosion measurements with specific example. [10]
- b) How metallic and non-metallic linings affects on corrosion? What do you mean by cathodic protection? [8]

OR

- Q10)**a) Explain the Chemical and Mechanical methods of surface treatment coatings with suitable examples. [10]
- b) What do you mean by fretting corrosion? Explain it with suitable illustration. [8]



Total No. of Questions : 10]

SEAT No. :

P3743

[Total No. of Pages : 2

[5461]-617

B.E (Chemical)

PETROLEUM REFINING (Elective - I)
(2015 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q. No. 1 or 2, 3 or 4, 5 or 6, 7 or 8 & 9 or 10.
- 2) Figures to right indicate full marks.
- 3) Neat diagram must be drawn whenever necessary.
- 4) Assume suitable data, if necessary.

- Q1)** a) Write in detail about production of crude oil and natural gas. [6]
b) Discuss the test and properties of gasoline & lube oil. [4]

OR

- Q2)** a) Write in detail about origin and formation of petroleum. [5]
b) Describe drilling for oil and gas. [5]

- Q3)** a) Write in detail about pre-refining techniques of crude oils. [5]
b) Explain cocking operation with neat schematic diagram. [5]

OR

- Q4)** Describe hydro-cracking techniques with neat schematic diagram. [10]

- Q5)** a) Discuss brief about various properties of lube oil. [8]
b) Describe deasphalting process with neat schematic diagram? [8]

OR

- Q6)** a) What is a solvent extraction technique? Describe solvent extraction with schematic diagram. [8]
b) Describe the bitumen manufacturing process with typical diagram. [8]

P.T.O.

- Q7)** a) Describe process of Hydro-treating with neat schematic diagram. [9]
b) Write in details about hydrogen sulphide removal processes. [8]

OR

- Q8)** a) Discuss the Environmental pollution aspects in the refinery. [9]
b) Write in details about Thermal Cracking of H₂S. [8]

- Q9)** a) What are the recent advances in the housekeeping techniques in refineries. [9]

- b) Write in details about transportation of petroleum products. [8]

OR

- Q10)** a) Discuss the various strategies of marketing of petroleum and petrochemical products. [9]

- b) Write in details about various types of additives used in the petroleum products. [8]



Total No. of Questions : 10]

SEAT No. :

P3354

[Total No. of Pages : 2

[5461]-618

B.E.(Chemical)

CHEMICAL PROCESS SYNTHESIS

(2015 Course) (Semester-I) (409345A) (Elective-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

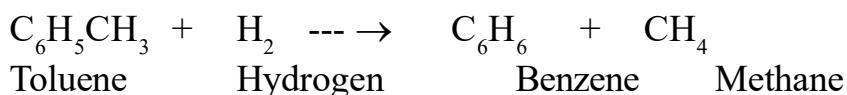
- 1) Answer five questions.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Explain Hierarchy of process design. [10]
b) Write in brief different considerations in process design.

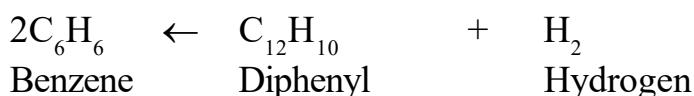
OR

Q2) Discuss reactor performance in detail. [10]

Q3) Benzene is to be produced from toluene according to the reaction. [10]



some of the benzene formed undergoes a number of secondary reactions in series to unwanted by products that can be characterized by the reaction to diphenyl, according to the reaction.



The compositions of the reactor feed and effluent streams. Reactor feed and effluent streams are as follows.

Component	Inlet flow rate (kmol·h⁻¹)	Outlet flow rate (kmol·h⁻¹)
H ₂	1858	1583
CH ₄	804	1083
C ₆ H ₆	13	282
C ₆ H ₅ CH ₃	372	93
C ₁₂ H ₁₀	0	4

PTO.

Calculate the conversion, selectivity and reactor yield with respect to the:

- a) Toluene feed
- b) Hydrogen feed

OR

Q4) Explain idealized reactor model for ideal batch reactor, mixed and plug flow reactor. [10]

OR

Q5) a) Discuss various types of dryers. [8]
b) Explain differential distillation with suitable example. [8]

OR

Q6) Write notes on: [16]
a) Adsorption
b) Centrifugal separation

Q7) Explain with sketches the concept of heat integration of sequences of simple distillation Column. [18]

OR

Q8) a) Discuss integration of refrigeration cycle. [9]
b) Explain threshold problems in heat exchanger network. [9]

Q9) a) Explain the concept of Pinch technology. [8]
b) Explain graphically heat recovery pinch. [8]

OR

Q10) a) Explain the intensification of hazardous materials. [8]
b) Write in brief on Toxic releases from processes. [8]



Total No. of Questions : 10]

SEAT No. :

P3744

[Total No. of Pages : 2

[5461]-619

B.E (Chemical)

**INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP
(2015 Pattern) (Elective - II) (Semester - I)**

Time : 2.5 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q. No. 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.
- 2) Figures to right indicates full marks.
- 3) Neat diagram must be drawn whenever necessary.
- 4) Assume suitable data, if necessary.

Q1) Differentiate between :

- a) Entrepreneur and Intrapreneur. [5]
- b) Entrepreneur Vs. Entrepreneurship. [5]

OR

Q2) Write short note on :

- a) Attributes and Characteristics of a successful Entrepreneur. [5]
- b) Manager. [5]

Q3) Describe Environmental Analysis Search and Scanning techniques. [10]

OR

Q4) Explain the role of central government and state government in promoting entrepreneurship developments. [10]

- Q5)** a) Write an explanatory note of team role theory by Tuckman. [8]
b) Discuss various management theories and managerial work. [8]

OR

- Q6)** a) Explain Business communication and communication process. [8]
b) Explain the use of visual and presentation aides. [8]

P.T.O.

- Q7)** a) Elaborate on Six Sigma concept. Enlist its requirements and advantages. [9]
b) Elaborate on computer based project management. [8]

OR

- Q8)** a) Describe Resource management & crashing techniques. [9]
b) Explain various project management based on microsoft project. [8]

- Q9)** a) Write note on marketing research, product & brand management. [9]
b) Describe promotion and pricing techniques. [8]

OR

- Q10)** a) Discuss the various strategies of Product and brand management. [9]
b) Describe the analyzing and interpreting the data for marketing decisions. [8]



Total No. of Questions : 10]

SEAT No. :

P3745

[Total No. of Pages : 2

[5461]-620

B.E (Chemical) (Semester - I)

PIPING DESIGN AND ENGINEERING

(2015 Pattern) (Elective - II)

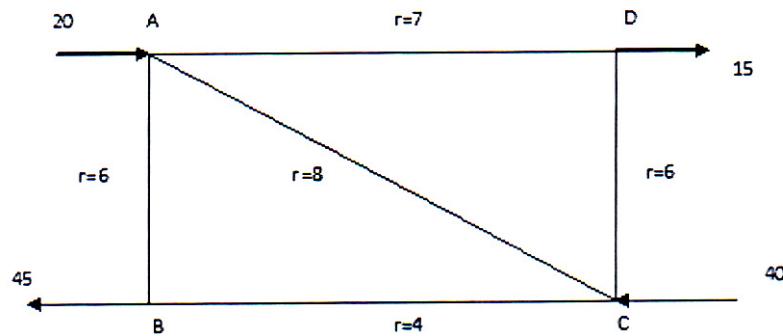
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q. No. 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.
- 2) Neat diagram must be drawn whenever necessary.
- 3) Figures to right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) For the network shown in figure shown in figure. The head loss is given by $hf = rQ^2$. The values of r for each pipe, and the discharge into or out of various nodes are shown in the figure. The discharges are in an arbitrary unit. Obtain the distribution of discharge in the network. [10]



OR

Q2) Explain functions and properties, types of gaskets and their selection. [10]

Q3) Explain sizing of Control Valve. [10]

OR

Q4) Explain different pipe fittings. [10]

Q5) a) Explain calculation of pipe diameter and thickness. [8]
b) Explain the homogeneous and Heterogeneous flow in slurry pipe lines. [8]

P.T.O.

OR

- Q6)** a) Explain line sizing for vacuum pipelines. [8]
b) Explain line sizing for slurry pipelines. [8]

- Q7)** a) Calculate the critical radius of insulation for asbestos [$k = 0.17 \text{ W}/(\text{m.K})$] surrounding a pipe to a room air at 293 K (20°C) with $h = 3.0 \text{ W}/(\text{m}^2\text{K})$. Calculate the heat loss from a 473 K (200°C), 50 mm diameter pipe when covered with the critical radius of insulation and without insulation. Would any glass fiber insulation having a thermal conductivity 0.04 $\text{W}/(\text{m.K})$ cause decrease in heat transfer? [8]
b) Derive relation for critical radius of insulation for circular cross-section having radius R and length L. [8]

OR

- Q8)** a) Write a short Notes on : [10]
i) Critical thickness of insulation
ii) Hot and Cold insulation in piping
b) Explain insulation material selection criteria and typical insulation specifications. [6]

- Q9)** a) Explain BOM and Piping isometrics. [9]
b) Explain piping layouts considerations of [9]
i) Reactors
ii) Storage Tank

OR

- Q10)** a) Explain PFD and P&ID. [9]
b) Explain piping layouts considerations of [9]
i) Heat Exchangers
ii) Distillation Column



Total No. of Questions : 10]

SEAT No. :

P3746

[Total No. of Pages : 2

[5461]-620-A

B.E (Chemical)

**ADVANCED SEPARATION PROCESSES
(2015 Pattern)**

Time : 2.5 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q. No. 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.
- 2) Figures to right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain Heterogenous azeotropic distillation with an example. [5]
b) Describe multicomponent distillation in detail. [5]

OR

- Q2)** Explain reversible chemical complexation with applications. [10]

- Q3)** Write short notes on the following - [10]
a) Reactive crystallization.
b) Reactive distillation.

OR

- Q4)** Explain Thiele-Geddes method in detail. [10]

- Q5)** a) Explain the membrane technology with different classifications of the membrane used. [8]
b) Define the fouling of the membrane. Explain the membrane fouling in RO. [8]

OR

- Q6)** Explain the mechanism of the following processes. [16]
a) Pervaporation
b) Electrodialysis

P.T.O.

Q7) What is chromatography? And give the classification of chromatography methods with detail applications. [16]

OR

Q8) Explain PSA and TSA with schematic diagram. [16]

Q9) Write short notes on : [18]

- a) Froth Floatation
- b) Zone electrophoresis

OR

Q10) Write short notes on : [18]

- a) Zone refining
- b) Ultra centrifugation

